CTOBER, 1944

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

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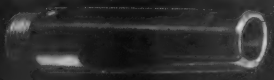
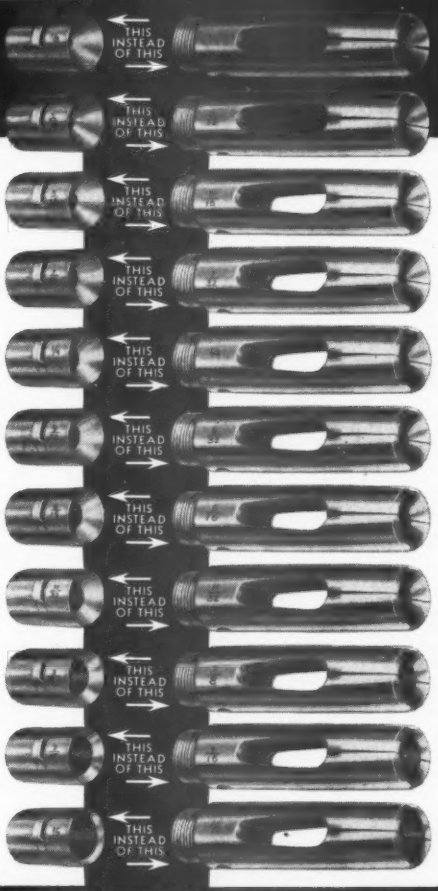


Style "B"
Master Feed Fingers
and Replaceable Pads



Save Material

The illustrations graphically show the material saved when a HARDINGE Style "B" Master Feed Finger and interchangeable Pads are used instead of conventional solid feed fingers.

Although this saving has been going on in screw machine departments using Style "B" since 1928, it is now more important than ever before as the economy not only saves money for you, but also conserves steel which is of vital importance today.

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THE TOOL & DIE JOURNAL

GEORGE J. HUEBNER • EDITOR, PUBLISHER

Technical Editor, E. WILLARD PENNINGTON **Assistant Editor, PAUL L. REED**

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The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling

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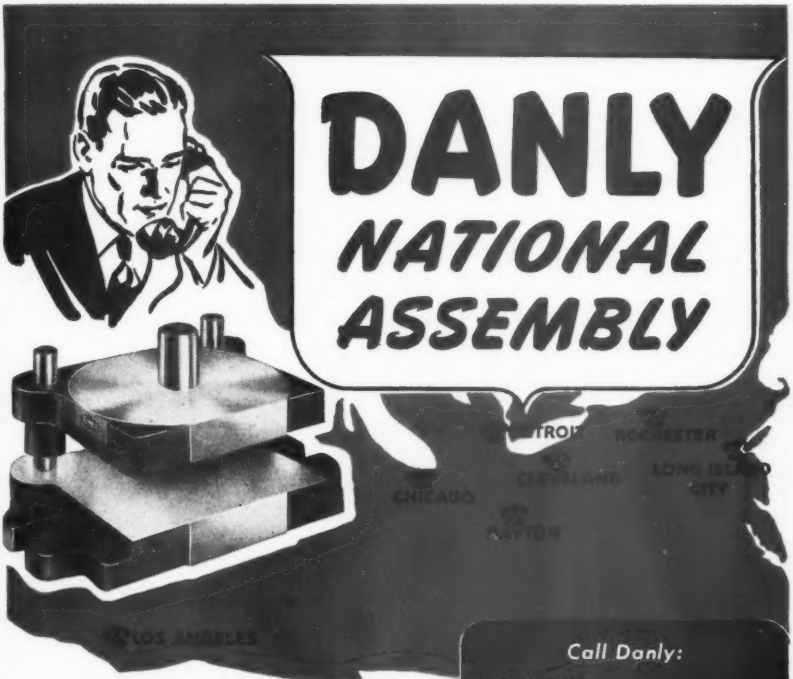

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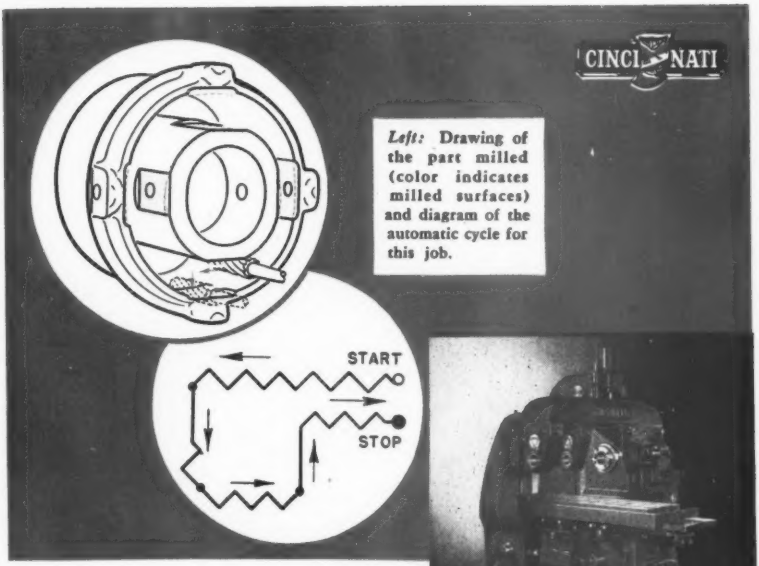

Left: Drawing of the part milled (color indicates milled surfaces) and diagram of the automatic cycle for this job.

and four opposing flats on the outside diameter of the hub. Each pair of flats is automatically milled in one cycle, the work indexed to the next station, the second pair milled, and so on. After loading the fixture, the operator merely starts the cycle and indexes the work.

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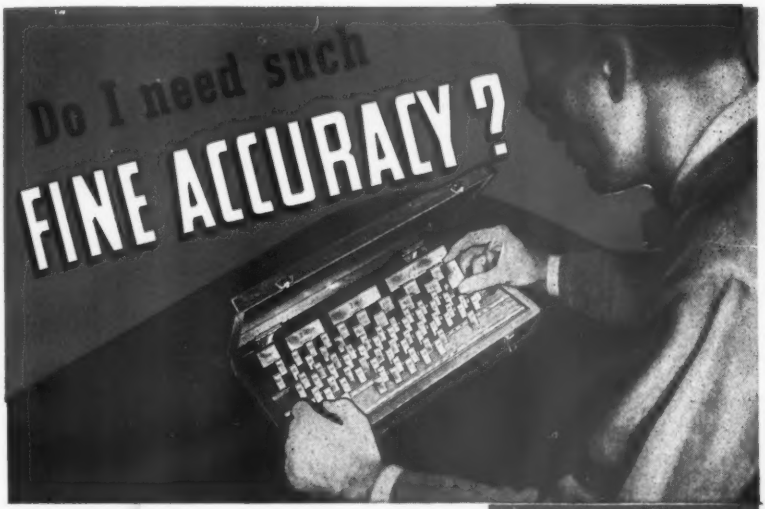
Model 62 (Size 2)	Takes 1/4 to 1/2 tool	Model P62 (Size 2)	Takes 1/4 to 1/2 tool
Model 64 (Size 4)	Takes 5/16 to 5/8 tool	Model P64 (Size 4)	Takes 5/16 to 5/8 tool



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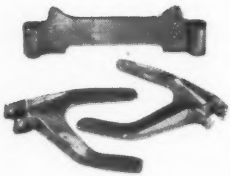

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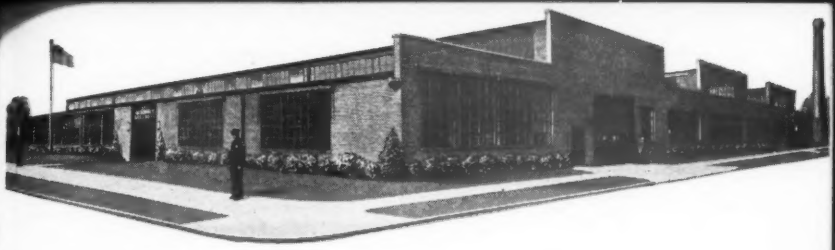

in the RIGHT DIRECTION-

Right Foot" with Tooling Problems

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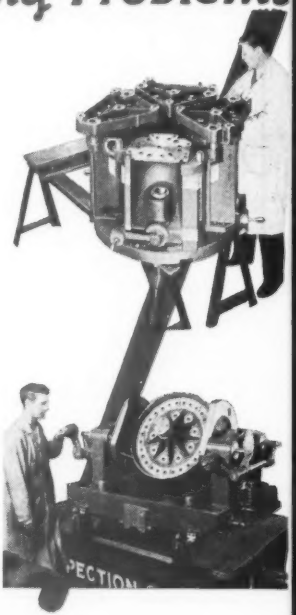

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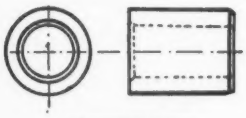
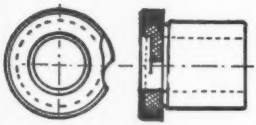
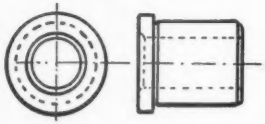


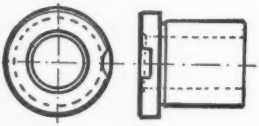
PRESS FIT



SLIP RENEWABLE



HEAD PRESS FIT and HEAD LINERS



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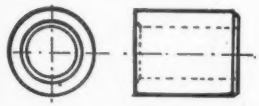

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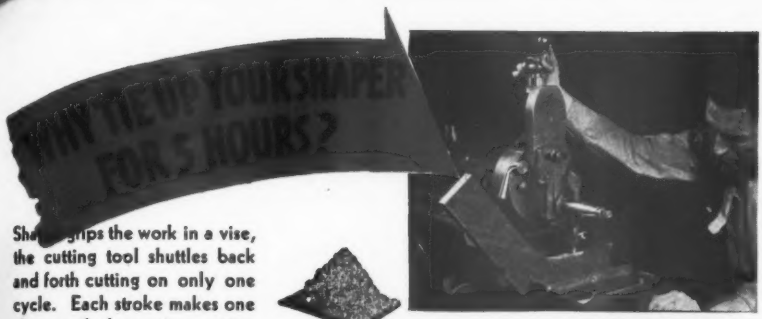

She grips the work in a vise, the cutting tool shuttles back and forth cutting on only one cycle. Each stroke makes one chip until the entire section removed is reduced to a worthless heap.

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Performance

The outstanding performance of the WOODWORTH LIMITROL Comparator Gage has proved its superiority over other gaging methods. LIMITROL checks errors involving pitch diameter, lead, taper, angle, out-of-roundness and straightness. It eliminates "feel," reduces scrap, and cuts inspection costs by combining greater speed with greater accuracy. Write for LIMITROL catalog No. 44-L.

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

PRECISION GAGES · PRECISION MACHINED PARTS · HEAT TREATING · PLATING

HERE'S HOW TO QUICKLY REMOVE THE BURRS LEFT BY CUTTING TOOLS AROUND THE EDGES OF HOLES ON MACHINED AND SHEET METAL PARTS!

NOBUR

BURR-REMOVING TOOL

Park NO-CARB PREVENTS

CARBURIZATION

No-Carb prevents carburization in selected areas when applied to clean surfaces of low-carbon steels.

DECARBURIZATION

No-Carb prevents decarburization when used on finished high-speed tools, or on bars or billets of high-speed steel.

CAN BE APPLIED BY:

Park's No-Carb prevents undesired carburization and decarburization when applied with brush or spray gun on clean metal surfaces.

There is a definite advantage in using No-Carb, because on most jobs it can be applied by brushing or spraying directly from the can after stirring—there is no time wasted in adding to or diluting No-Carb

No-Carb is removed from bars and billets by the rolling mill, while sand blasting or immersion in a boiling solution of ammonium bifluoride (10-50%), in a wood, or lead or copper lined, tank will remove No-Carb from

BRUSHING

SPRAYING

finished parts or tools. If you are looking for a liquid paint to do a better job of preventing carburization or decarburization it will pay you to try Park's No-Carb—a sample will be sent to you upon request.

SPECIALISTS IN HEAT TREATING MATERIALS FOR 32 YEARS

For 32 years the Park Chemical Company has been specializing in the manufacture of heat treating materials. Today Park's Laboratory Controlled Products are recognized for high quality by manufacturers who demand the best results in their heat treating departments.

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PARK CHEMICAL CO.

● Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

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Tools Sustain the Invasion!

Winning a beach-head is but the first step in any successful invasion. So, too, purchase of good tools is only the first step to efficient metal working.

Care of tools—through proper sharpening and usage—must follow. Cutting tools must produce to their ultimate if D-Day is to become V-Day!

National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A.

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

METAL *Stampings* DUPLICATED WITHOUT DIES

With DI-ACRO Precision Machines

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

SHEARS

BRAKES

BENDERS

SHEARS

Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width—Shear No. 1—6". Shear No. 2—9". Shear No. 3—12".

BRAKES

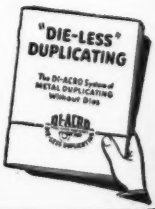
Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No. 2—12". Brake No. 3—18".

BENDERS

Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity—Bender No. 1—$\frac{1}{2}$" round cold rolled steel bar. Bender No. 2 and No. 3—$\frac{1}{4}$" cold rolled steel bar.

Send for Catalog "DIE-LESS DUPLICATING"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

Pronounced "DIE-ACK-RO"

O'NEIL-IRWIN MFG. CO.

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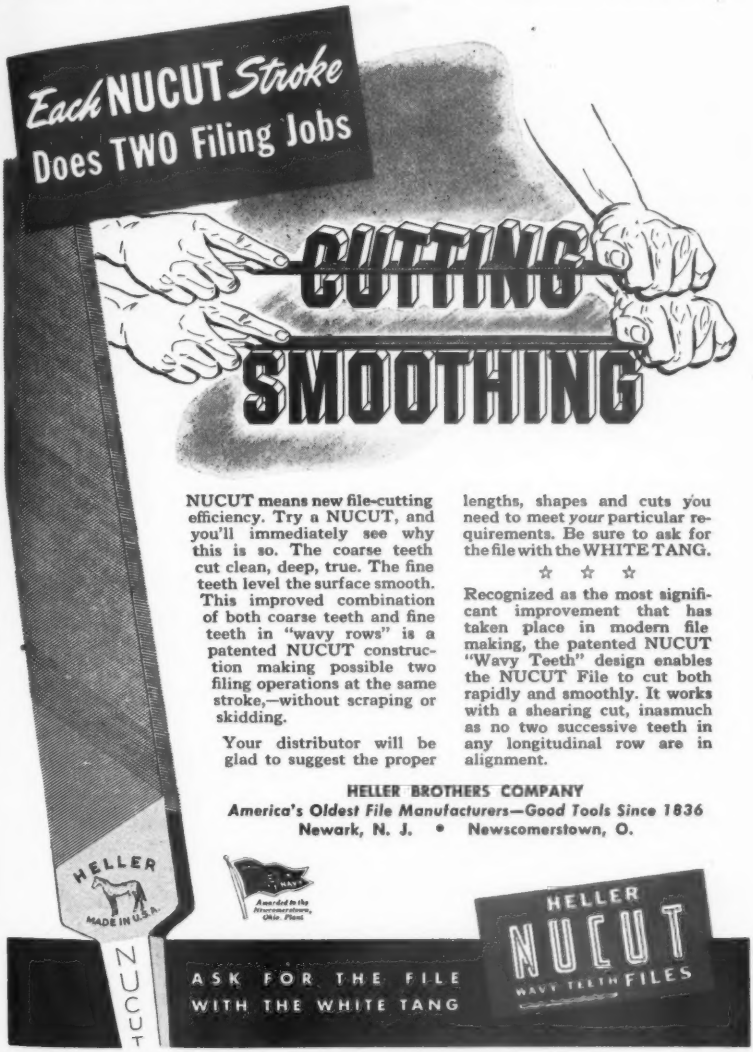
NUCUT TWO-FILE FILING HELPS STEP UP WARTIME PRODUCTION



NUCUT means new file-cutting efficiency. Try a NUCUT, and you'll immediately see why this is so. The coarse teeth cut clean, deep, true. The fine teeth level the surface smooth. This improved combination of both coarse teeth and fine teeth in "wavy rows" is a patented NUCUT construction making possible two filing operations at the same stroke,—without scraping or skidding.

Your distributor will be glad to suggest the proper lengths, shapes and cuts you need to meet *your* particular requirements. Be sure to ask for the file with the WHITE TANG.

☆ ☆ ☆

Recognized as the most significant improvement that has taken place in modern file making, the patented NUCUT "Wavy Teeth" design enables the NUCUT File to cut both rapidly and smoothly. It works with a shearing cut, inasmuch as no two successive teeth in any longitudinal row are in alignment.

HELLER BROTHERS COMPANY

America's Oldest File Manufacturers—Good Tools Since 1836

Newark, N. J. • Newcomerstown, O.

Awarded to the Newcomerstown, Ohio, Plant.

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COLLET CHUCKS

Allison model #3 for 2½" spindles and under—with 1 5/8" collet capacity has full circular low pressure cam that activates the collet closing mechanism, eliminating any possibility of stock slippage.

Above is model #1 for 1½" 8-thread spindle lathes—with 7/8" collet capacity.

Allison TOOL & ENGINEERING COMPANY
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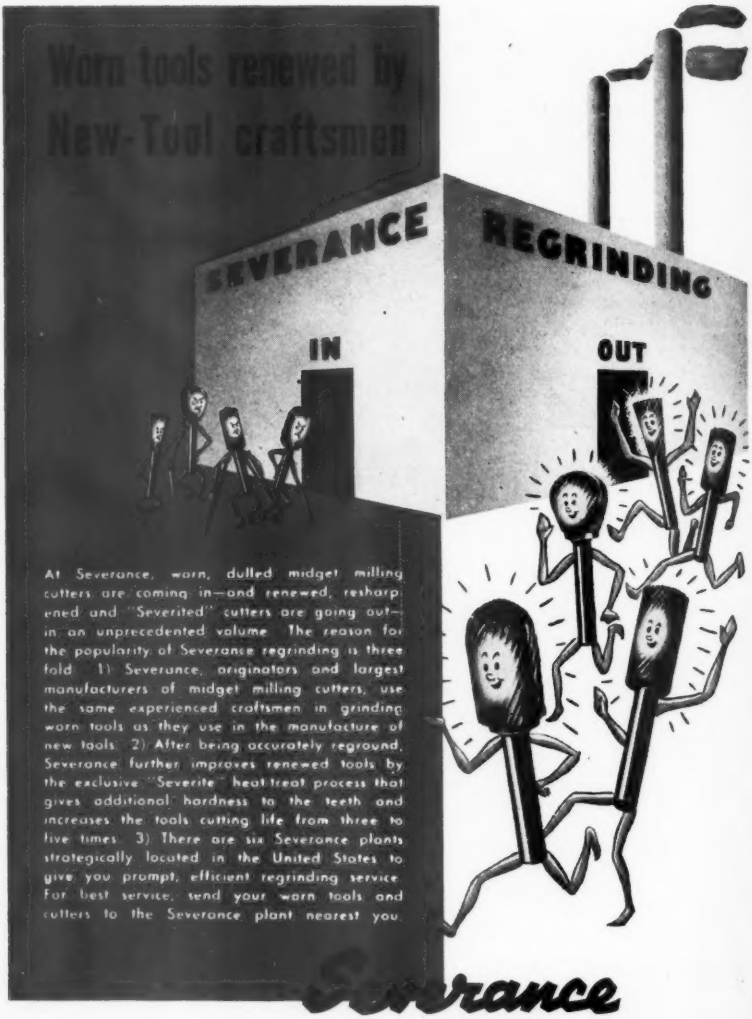
WRITE FOR NEW ALLISON CATALOGUE — SEE YOUR LOCAL DISTRIBUTOR

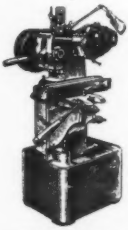
KNOCK-OUT
UNIVERSAL TOOL GRINDER
MODEL B 660
"SPEED HEAD"
KNOCK-OUT
H. O. LEE COMPANY • Aberdeen, So. Dak.


Worn tools renewed by
New-Tool craftsmen
SEVERANCE
IN
REGRINDING
OUT
At Severance, worn, dulled midget milling cutters are coming in—and renewed, resharpened and "Severited" cutters are going out—in an unprecedented volume. The reason for the popularity of Severance regrinding is threefold. 1) Severance, originators and largest manufacturers of midget milling cutters, use the same experienced craftsmen in grinding worn tools as they use in the manufacture of new tools. 2) After being accurately reground, Severance further improves renewed tools by the exclusive "Severite" heat-treat process that gives additional hardness to the teeth and increases the tools cutting life from three to five times. 3) There are six Severance plants strategically located in the United States to give you prompt, efficient regrinding service. For best service, send your worn tools and cutters to the Severance plant nearest you.
Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • Severance Tool Industries Inc., Saginaw, Michigan • Plants in Long Island City 1, New York; Detroit 2, Michigan; Fort Wayne 8, Indiana; Chicago 6, Illinois and Los Angeles 21, Cal. In Canada: 60 Front St., W., Toronto, Ont.

LATHE CARRIAGE FLEXIBILITY

KEEPS NICHOLS MILLERS BUSY



Precision turning, boring, recessing, jobs you'd normally assign to toolmaker's lathes or expensive boring machines, come natural to Nichols Millers.

Lever-Rack-and-Pinion Transverse Feed is the answer. This exclusive Nichols development assures the *extra utility* that makes the Nichols Miller *different* from conventional hand millers. It adds lathe-carriage flexibility to your most intricate machining operations while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Simple fixtures, made possible by the rise-and-fall spindle, reduce set-up time, even in the hands of semi-skilled operators on production lines, in toolrooms and laboratories.

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ALL NICHOLS MILLERS ALL DIFFERENT JOBS

Milling Two Slots Inside a Ring, accurately located in relation to one another and to drilled master holes.

Precision Boring with Rack and Pinion transverse feed to a ±.0002" tolerance on a 3" diameter.

Reaming Two Holes to ±.0005" location with two rack and pinion feeds and a quick-action work holder.

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"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

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American's Complete Broaching Service

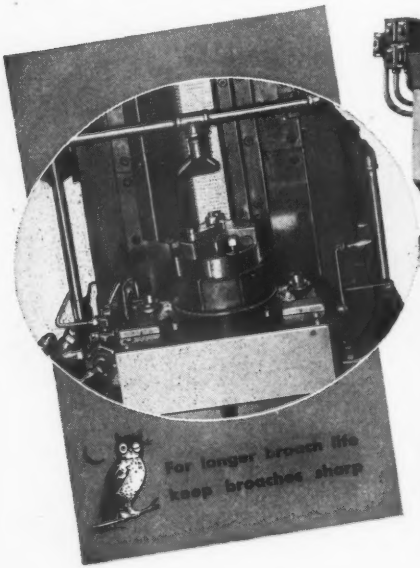
Solving Production Problems of War

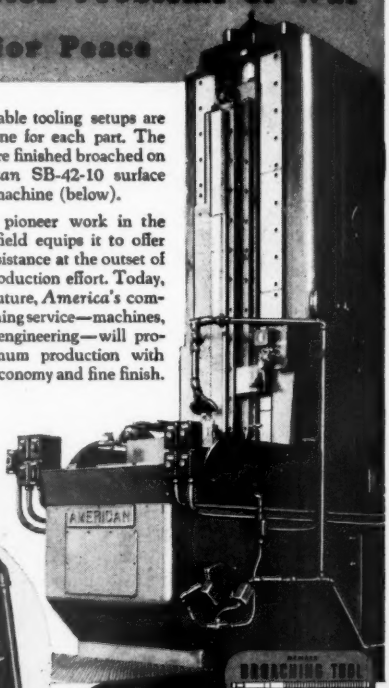
. . . Ready to Plan for Peace

The advantages of broaching by *American* are well known to the Nation's leading manufacturers. Almost every war industry has made use of broaching, the *American* way, to secure fast, accurate, economical output.

For example, in the production of a new aircraft part, one operation entails the finishing of a two-part stop sleeve. An *American* SB-66-15 surface broaching machine (right) rough broaches radii between the lugs, sides of the lugs, and flat across the index of the lugs. Two interchangeable tooling setups are provided, one for each part. The parts then are finished broached on an *American* SB-42-10 surface broaching machine (below).

America's pioneer work in the broaching field equips it to offer valuable assistance at the outset of any new production effort. Today, and in the future, *America's* complete broaching service—machines, tools, and engineering—will provide maximum production with maximum economy and fine finish.





BROACHING TOOL

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
PRESSES
BROACHING TOOLS

Quick way to STOP DUST!

DUSTKOP
SELF-CONTAINED
DUST COLLECTORS

MODEL 600
DUSTKOPS are installed in a few minutes. Flexible metal hose makes slip fit with dust outlets on grinder.

MODEL 950
This unit, with dust hoods, "ready to go," fits any double-end pedestal grinder not already equipped with wheel guards and dust outlets.

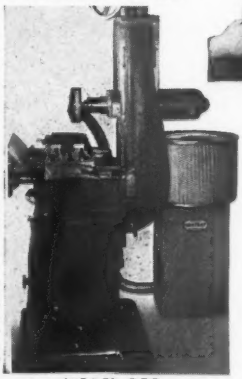
DUST STOPPED ON ALL ABRASIVE OPERATIONS AT LOWEST COST

MODEL 600
With flat, spun glass filter for compact bench installation. Pulls all dust from two grinder wheels.

For quick, economical, effective, dust control *at the source*, install DUSTKOPS. Easy to attach to surface grinders, disc grinders, cutter and tool grinders, flexible shaft grinders—or to buffers, sanders and abrasive cut-offs—whether single or multiple units. Large or small models available.

DUSTKOPS are compact and portable. Entirely self contained, with motor, fan, cyclone separator (in all but smallest models) and spun glass filter. Flexible metal hose permits quick installation.

DUSTKOPS clean the dust-laden air without wasting heat. Efficient cyclone separator provides low maintenance. Many other features make DUSTKOPS ideal for your shop or laboratory. Immediate shipment of "standard" voltage units.



MODEL 950—has cyclone separator, plus spun glass filter. For medium duty work of all kinds.

MODEL 950—with cyclone separator means low first cost, low maintenance, even on production surface grinder.

(Left)
MODEL 1250—one unit handles dust from four wheels.

MODEL 1250—gets all dust and smoke from this heavy duty abrasive cut-off, at extremely low cost.

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MOTORIZE *with* LIMA DRIVES

For unit motorization of Machine Tools, you can select no better drive equipment than that made by LIMA.

These units are built in sizes from 1 to 25 hp, to meet the users every requirment of selective speed drive equipment.

Our satisfied customers are proof that LIMA Gearshift Drives do their jobs *Faster* and with *Greater Precision and Safety*

Wire or write today for address of Lima Engineering Service nearest you. Let our Engineers show you how LIMA can serve in *your* plant.

Large enough to successfully serve you, yet small enough to give personal attention to your needs.

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REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

By the ELOX METHOD

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to "drill" holes of various shapes in hardened dies and machine elements without annealing.

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ELOX CORPORATION

3-252 GENERAL MOTORS BLDG.
DETROIT 2, MICHIGAN
Plant—18273 LIVERNOIS AVENUE
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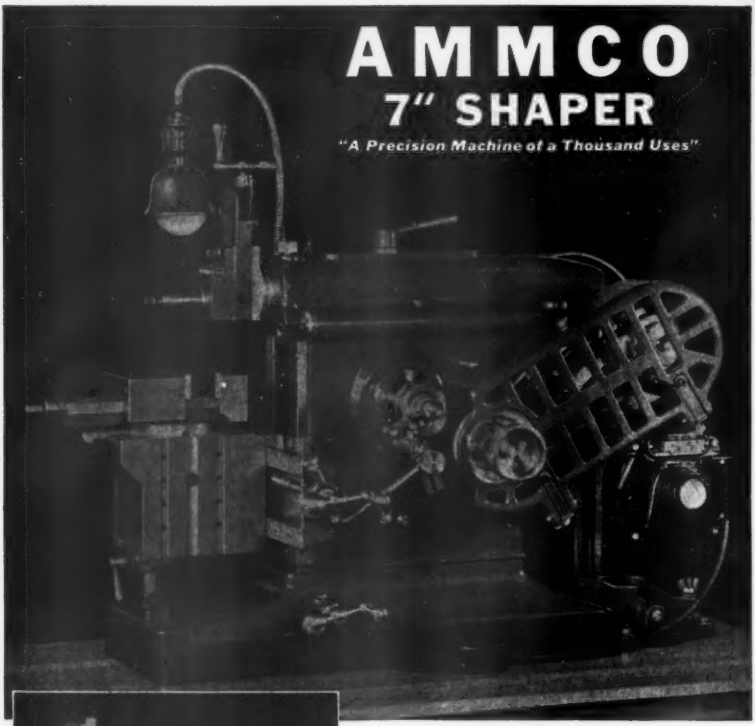
AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



IT'S PORTABLE

- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

Write today for specifications and prices

ARMY E NAVY

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

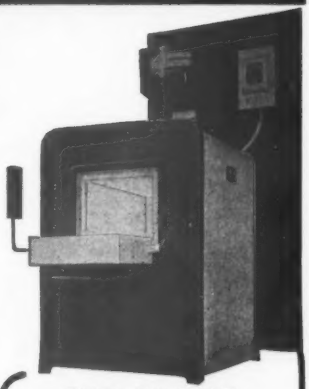
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
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WESSON VISE

makes ANY operator an EXPERT

Difficult angle set-ups can be made quickly . . . in a fraction of the time ordinarily required. Compact size, lowest overall height, ability to work in close quarters, and wide range of capacity permit many adaptations to standard machines . . . you multiply the uses of machine tools with WESSON Vises. Two sizes. See nearest distributor, or write for bulletin . . . WESSON PRODUCTS CO., 719 Fisher Bldg., Detroit 2, Michigan.

Don't let those "manpower blues" get you down when you have precision angle milling to do! Remember . . . WESSON Vises are immediately available. You can get *them* on the job, fast! And *any* operator can do expert precision angle milling, drilling, grinding, reaming, slotting, or what have you... with WESSON Universal Vises. Rugged and rigid, free from "chatter," these vises permit high speed precision-production or tool room service, and save time and money.

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Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

Name and Title.....

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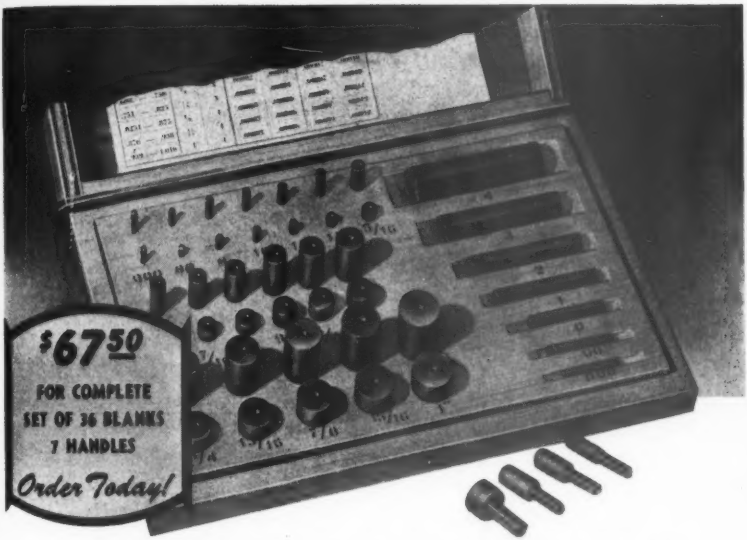


A BRAND NEW AND TIMELY SOLUTION TO YOUR GAGE PROBLEMS

Make your own PLUG GAGES quickly and at low cost with ATLANTIC EMERGENCY SETS

Any toolroom or shop equipped with a grinding machine capable of holding work to one or two tenths of a thousandth can quickly make up any size go- and no-go gage in a few minutes at a fraction of the usual cost of a finished gage—with the NEW ATLANTIC EMERGENCY SET of cylindrical plug gage blanks. Our mass production and modern heat treating methods enable us to produce in large volume and save you money over what it costs you to make up your own blanks a few at a time.

With the 36 blanks in steps of $\frac{1}{32}$" with handles in the complete ATLANTIC SET, you can make any size plug gage from .029" to 1.000". Only the O.D. must be finished by grinding when commercial finish is required. For gages of high standards, lapping is, of course, also necessary. Blanks are oil hardened to ample depth to permit regrinding to smaller sizes when gages wear.

To cover your emergency needs most adequately, we recommend the purchase of the complete set. However, we can supply blanks singly or in quantity from stock in any size shown in the set. Prices on application.

Order an ATLANTIC EMERGENCY SET today—and be prepared for any rush job that comes into your shop.

Specifications

BLANK MATERIAL—Non forming, oil hardening tool steel.

HEAT TREATING—Blanks hardened and drawn to Rockwell C-61-63. Taper Shank hardened, drawn and ground.

FACE—Polished for marking surface; square with O.D.

CENTERS—Clean, true 60° lapped bearing surfaces and of uniform depth; concentric with O.D. to within .003.

MALE CENTERS—60° concentric with O.D. to within .0005.

Scherr Comparitol and Gage Blocks are used to check plug gages. Send for complete details of these inspection tools.

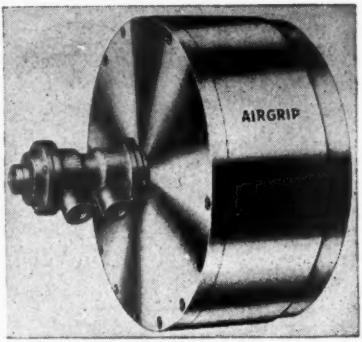
GEORGE SCHERR COMPANY, INC. 200-B LAFAYETTE ST., NEW YORK 12, N. Y.

Give WINGS TO PRODUCTION!

"Airgrip"

Revolving Air Cylinders

"AIRGRIP" Revolving Air Cylinders, on double ball bearings permit speeds formerly impossible. Minimum maintenance. Today's top speed and peak efficiency requirements in air chucks demand superior air cylinder performance and service. Under average conditions, the cylinder will run for years without attention. No manual adjustment of packings. Wear automatically taken up by air pressure within the cylinder.



"Airgrip" Chucks

Boost output records, slash costs. "Airgrip" Chucks double gripping power, externally or internally. Work held tight, even if air supply is cut off completely. "Airgrip" 2- and 3-jaw Universal Chucks permit heavier cuts and coarser feeds.

Hi-Po Supercharged Hydraulic Pressure Pumps

3000 lb.-Pressure Pump, driven by a ½ h. p. motor! Double-Pressure Production; low-pressure section super-charges a high-pressure section. Builds up pressure fast, with minimum pulsation.

Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

Anker-Holth Mfg. Co.

2735 Connors St. Port Huron, Michigan

Tannewitz
VARIABLE SPEED BAND SAWS
Are Metal-Cutting EXPEDITERS!

Removing gates and risers from steel, cast iron, manganese, bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 speed ratio from 100:300 to 1000:3000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

Other models (single speed) for such purposes as sawing large blocks of aluminum and magnesium, cutting large steel templates, etc., are available in capacities and speeds to ideally accommodate work of practically any size or character. For complete facts write for bulletin on Variable Speed Band Saws. Also on request, bulletins on: Sheet Metal Cutting Band Saws; DI-SAWS, combination band saws for sawing, filing and polishing.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

Sharp, Clear Impressions
ON ALL METAL MARKING JOBS!

ANY METAL PART that requires a serial number, a catalog number, size identification—or any other type of marking—can be quickly and *clearly* marked with Mercury Steel Letters and Figures!

These Stamps are made of the finest carbon steel to protect against breakage and give you years of service on all part marking work. The letters or figures are deep cut with sharp faces for ease of stamping on even the hardest metals. Accurate bevel further assures clear impressions, and aids in alignment. The husky steel body is amply large to withstand severest use.

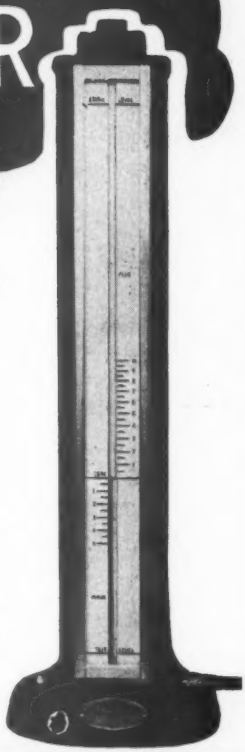
A large stock of Mercury Steel Letters and Figures in sets and sorts is available in sizes to meet a complete range of metal marking needs. Special sizes can be made to your specifications, if desired. *Write Dept. D for complete details, and briefly outline your marking problem for our recommendation on the Mercury Stamps to meet your needs!*

Metal Marking Tool Specialists for Over 25 Years

MERCURY METAL DIE AND LETTER CO.
SOUTH SAN PEDRO AT SIXTEENTH STREET • LOS ANGELES 15, CALIFORNIA

"GAUGED ON ITS MERITS"

The METRICATOR is FIRST



For **PRECISION MEASUREMENTS** *of*

INTERNAL DIAMETERS
EXTERNAL DIAMETERS
TAPER AND STRAIGHTNESS
SLOTS AND THICKNESS
CONCENTRICITY AND ALIGNMENT

All METRICATOR gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.

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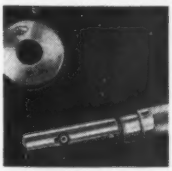

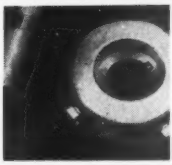

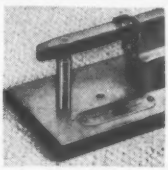

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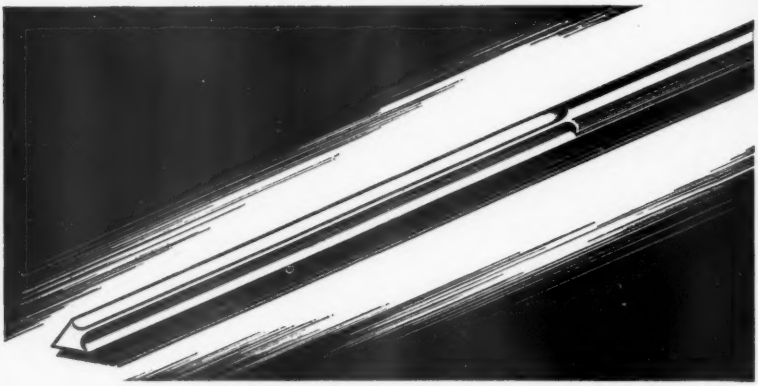

UNDERWOOD ELLIOTT-FISHER CO. MAKES PRODUCTION RECORDS ON CARBINE BARRELS

. . . with L& I Reamers

By developing new procedure and new tool designs, Underwood has made production history in turning out .30 calibre M-1 carbine barrels. Special L & I reamers were used on this job.

We quote from *The Iron Age*, May 25, 1944:

"Perhaps the most important operation on the barrel is reaming. Baush 12 spindle hydraulic deep hole reaming machines are used, with six fluted push reamers. The reamers have three alternate lips relieved 1⅝ in. from the end for chip clearance. The barrel hole is rough reamed to 0.296-0.297 in. and finish reamed to 0.300-0.302 in. in diameter at the unconventional feed of 14 in. per min. This *feed is three times faster than genenally recommended* for this operation *and the remarkable feature is that the hole is finished with two reams where it formerly required three and four reams*."

To achieve similar improved reamer production, send us a trial order, or write for literature.

L&I **GROUND FLUTE REAMERS**

LAVALLEE & IDE, INC. CHICOPEE, MASS.

In step with your needs

You need not go out of your way to buy Socket Head Cap Screws, Socket Set Screws, Stripper Bolts, Pipe Plugs, Square Head Dog Point Set Screws, Keys, or other Standard Screw Products manufactured by The Chicago Screw Company. These fine products are sold only thru authorized distributors — and there is one near you, ready to take care of your requirements . . . You will be pleased with the superior quality of our products, and more than satisfied with the service of our distributors.

ARMY E NAVY

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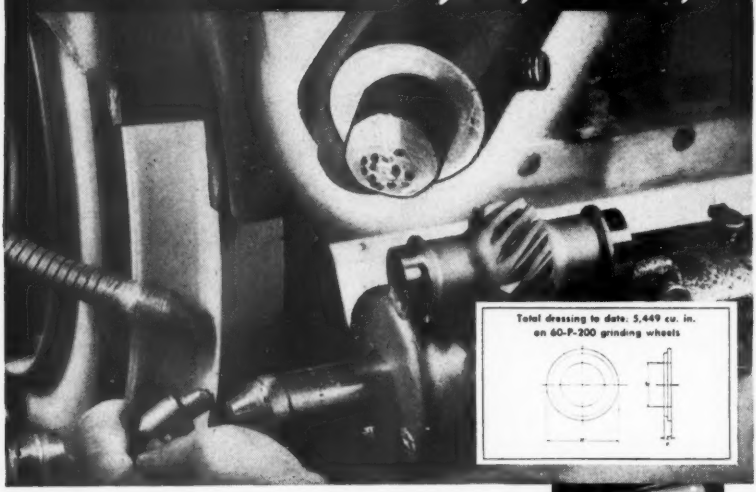
TAKING IT ON THE NOSE for 90 DAYS

. . . and Still Going Strong!



In continuous use for 90 days in the plant of a well-known midwestern aircraft engine plant, dressing the face and recess in a 60-P-200 grinding wheel—that's the record of the No. 2-B diamond-impregnated Carboloy Dresser shown above. Taking it "on the nose" for 3 months and still going strong—still plenty of diamonds left for additional service, after dressing a total of 5,449 cu. in. of wheel stock.

Carboloy Diamond Dressers are especially designed for unusually long periods of service on a wide range of work—the "tough" jobs as well as the "easy" ones. Loaded from base to "peak" with high quality diamond particles permanently held in a Carboloy matrix, these dressers require no remountings and provide layer upon layer of diamond cutting surfaces. Just a quarter turn daily of dresser in holder—plus an occasional 2- to 5-minute reconditioning—and the Carboloy Dresser keeps working throughout an extremely long period of profitable life. Try it once and you'll never go back to "temperamental" costly single diamonds.

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Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND DRESSERS IMPREGNATED

For GENERAL USE ON GRINDING WHEELS

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

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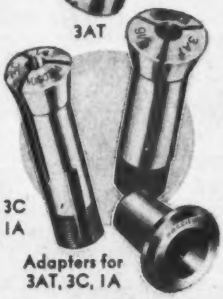
480
(AC-50)

3AT



3C
1A

Adapters for
3AT, 3C, 1A

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

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- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
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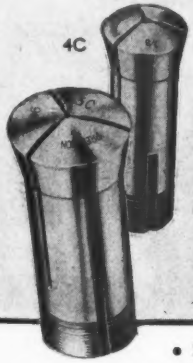
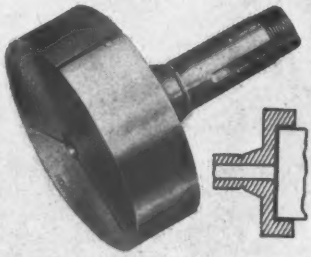
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.



4C

KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



- 5C KLUTCH-KOLLET NOW READY. List Unbored $10.50.
- PRECISION Collets also available in Hexagon and Square.

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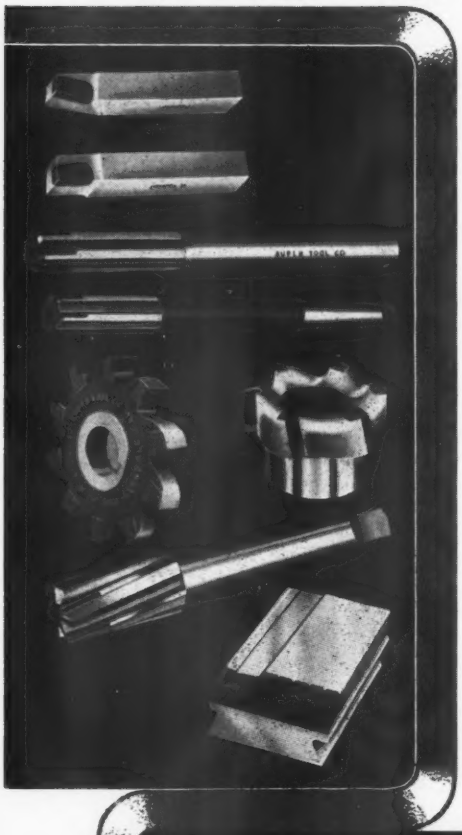
FOR SPEED AND ACCURACY ON EVERY CUTTING JOB



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For turning, boring or facing these single point tools are extremely efficient when machining all materials including hard steels. They cut fast, clean and true. Low heat absorption means less pitting when cutting soft steels.

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These extremely fast, true and clean cutting solid type standard reamers are available with either a straight or tapered shank. They have proved their ability to hold their size over long runs on all types of reaming jobs.

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For faster production, greater accuracy and money-saving economy on all types of milling jobs—cast iron and non-ferrous materials as well as steel. The low cost of these milling cutters permits their use on short as well as long runs.

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The wide experience of Super Tool engineers is backed by unequalled laboratory resources for creating special tools to meet your specific production needs. Super special tools are speeding production in hundreds of war plants. Send us your prints and specifications for recommendations and estimates.

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We can handle orders in quantity and guarantee quick service (by present day standards).

VARD Acme thread snap gages are equipped with John-Sons type rolls and the improved VARD frame. VARD Acme plugs are equipped with lightweight metal handles and are made in taper-lock, tri-lock and annular types.

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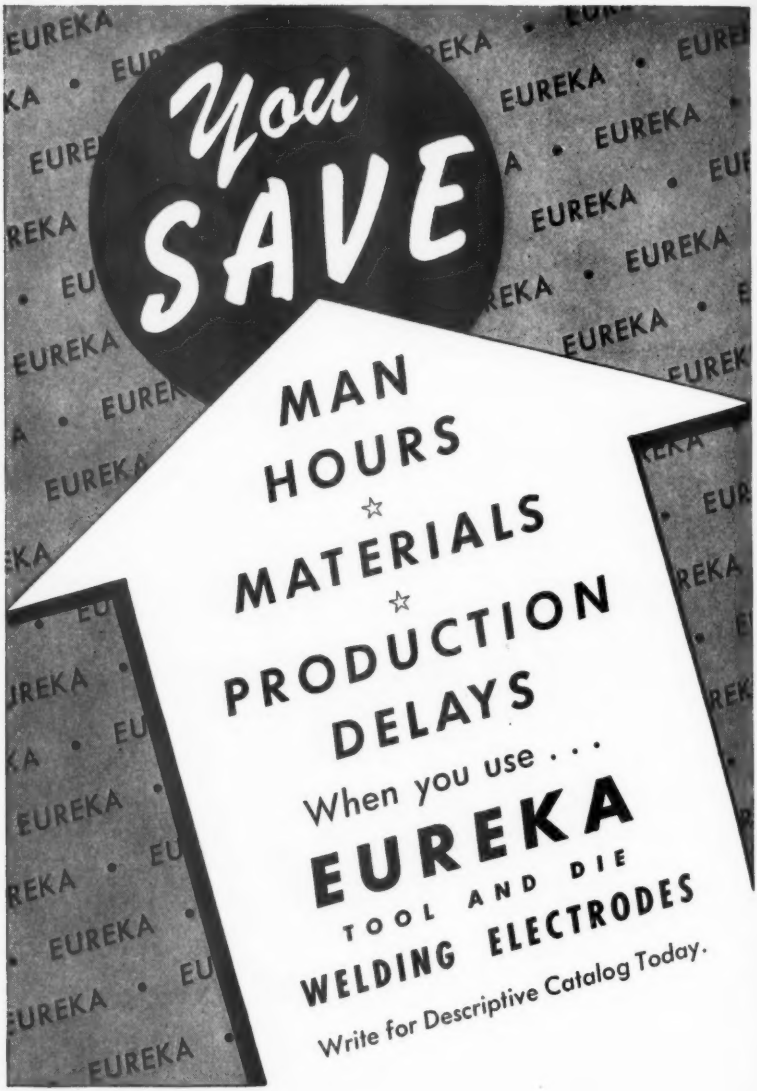
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Typical Jobs

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Compressor Yoke. Alignment maintained and better finish produced.

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Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Bearing. A very small part. 2 micro-inch finish necessary.

Shell Loading Die.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

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Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming

PARTS LAST LONGER

When Honed on the SUNNEN PRECISION HONING MACHINE

Time after time, users of the Sunnen Precision Honing Machine have shown that they get longer service and have fewer repairs than by any previous method of internal finishing.

There's a good reason for these results, too. This machine has an amazing record for accuracy. Straight, round holes are produced with a guaranteed accuracy of .0001". Accuracy has been held to .000025" on hardened steel jobs. A super-smooth finish of from 2 to 3 micro-inches provides a better working surface.

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There are many other reasons why the low-cost Sunnen Precision Honing Machine will give you a finish that makes parts last longer. Get complete information by calling a Sunnen engineer to your plant—or write for free bulletin.

The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

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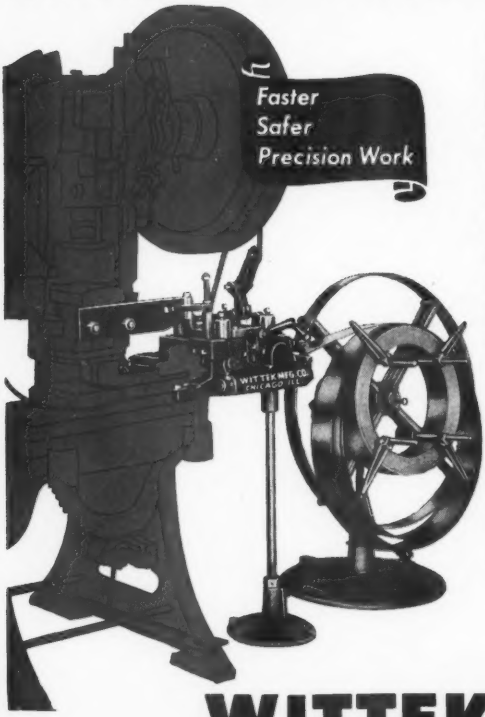
Planning Peacetime Production Using Coiled Strip Stock?

Equip with WITTEK Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

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Automatic
ROLL FEEDS
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REEL STANDS

● In addition to making a complete line of standard die sets, we are especially well equipped to produce special die sets to your specifications. Send us your prints for prompt action—or call the "Detroit" man in your area.

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Your purchasing standards related to quality will play a vital role in tomorrow's product leadership.

PRECISION-X*... FOR *YOUR* POST-WAR PRODUCT SUCCESS

PRECISION-X*

STANDS FOR THE "EXTRA" VALUES IN SMILLIE PRECISION PARTS, TOOLS AND FIXTURES.

Solving difficult precision problems for 55 years has enabled the C. M. Smillie Company to give industry a new advanced standard in Precision-X. Special tools, jigs and fixtures built for the automotive and lubrication industries provided the craftsmanship and experience for this development.

Today, Precision-X by Smillie combines this craftsmanship with modern facilities for obtaining the highest possible standard of precision on every part produced. It includes . . . engineering control . . . building special tools and fixtures . . . modern equipment for machining, milling, grinding, thread milling, finishing, inspection . . . and men of specialized skills with long experience in Smillie methods.

Working 100% for Victory production, these "extras" in Smillie Precision-X are going into aircraft and other vital war needs. Tomorrow, when peace-time products hold the stage, Precision-X will be ready to assure manufacturers the fundamental, basic quality that goes with product leadership. We suggest that you include these Smillie "extras" in your buying standards for tomorrow.

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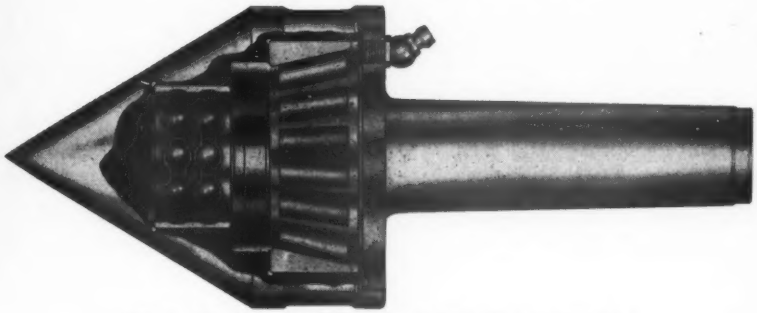

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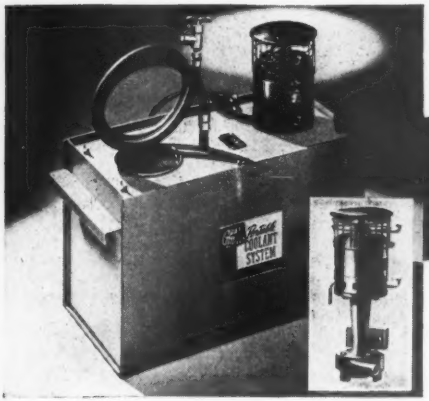

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NEW **Model 1130 Centrifugal PUMPING UNIT**

for applying coolants to grinders, cut-off machines and other tools, or for supplying lubricants, solvents, etc. Heart of the unit is Model 1100 Gray-Mills Centrifugal Pump (inset), capacity 360 GPH at 5' head; motor is 1/15 H. P. Pump is available as independent unit.

IN HUNDREDS of industrial applications Gray-Mills Pumping Units are supplying fluids, such as those listed above, for a variety of uses. These compact, self-contained systems apply a fluid at the point of use, either in constant flow or intermittently. They may be used for recirculating fluids, as in a coolant system — or to pump liquid from one point to another.

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Think over your fluid handling problems — perhaps you'll find a Gray-Mills unit is a simple, ideal low cost answer — and if you have a special problem, there is a Gray-Mills engineer ready to help you work it out. See your Mill Supply Distributor or write for catalog and full details.

*5 foot head.

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PROMPT DELIVERY

Complete Portable

PUMPING UNITS

FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS
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Close Limits and Fine Finish-

FOR EFFICIENT PRODUCTION

Close limits and a fine finish are essential for efficient production on many important metal working operations. Maximum output at minimum cost can be attained only when the methods and machines are such that close tolerances and the best possible finish can be maintained on piece after piece, indefinitely.

It is on this type of work—exacting toolroom jobs or production operations that call for toolroom accuracy—that the high precision and dependable performance of South Bend Lathes pay real dividends. Their smooth operation through a wide range of spindle speeds produces surprisingly fine finishes. In fact, when South Bend Lathes are installed, subsequent finishing operations can often be eliminated.

Today South Bend Lathes are better in every way. Our entire plant is devoted to lathe production—we manufacture no other products. There has been no lowering of standards because of war-time restrictions or shortages and the use of substitute materials is negligible, limited to non-essential parts such as name plates, paint, etc. Improvements have been accelerated to meet war production needs.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 having 10″ swing with 1″ collet capacity. Write for Catalog No. 100-C.

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LATHE BUILDERS FOR 37 YEARS
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To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write now for details of this plan.

SAVE PRODUCTION TIME

with a SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.

MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

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New Book

on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost per piece all are reduced accordingly.

These tools, which are made in types for dressing each specific form, are completely described and illustrated in a new booklet which we will be glad to send you on request. If you have thread grinding equipment, this booklet will point the way to substantial savings. Send for your copy.

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Ex-Cell-O Precision Grinding Spindles, fitted with Ex-Cell-O ball bearings specially developed for fast, accurate work, permit high finish in original grinding — often eliminating subsequent lapping and polishing. For complete information and specifications of Ex-Cell-O Precision Spindles, write for Catalog S-537.

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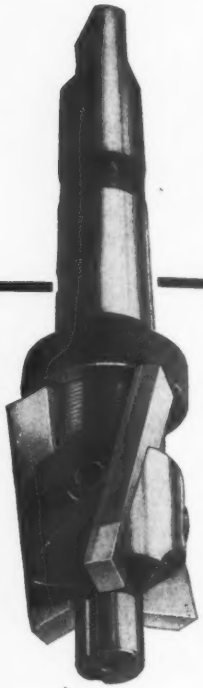
Precision MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS



This is the only standard inserted blade type **FACING AND COUNTERBORING TOOL**

GENESEE

Replaceable Blades — Interchangeable Pilots — Constant Chip Space

STANDARD SIZES FROM 1¼ TO 4 IN. IN DIAMETER

STYLE H tools are designed for heavy cuts where maximum stock removal is required.

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The Norton Bura-way Grinder combines new principles in the design of cutting tools in a machine which generates, reproduces and maintains relief angles constant as measured in the direction of feed. This provides the entire cutting edge of a tool with a uniform, adequate support including sections involving curves and radii.

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Is Readily Adapted to your Tool Room Procedure

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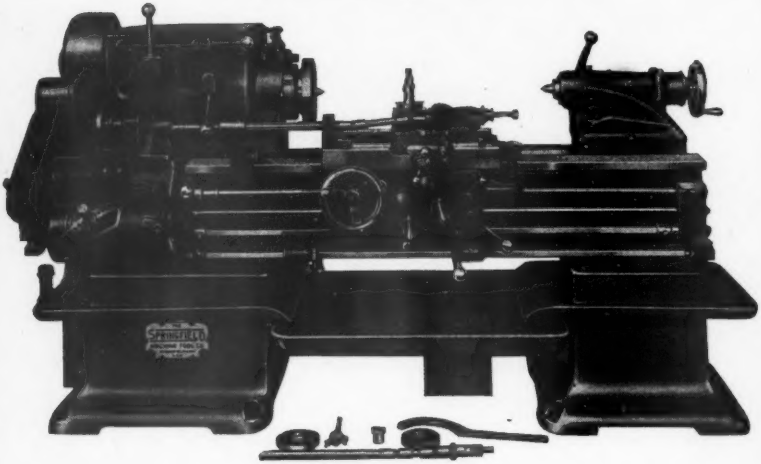
Out in front!



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Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

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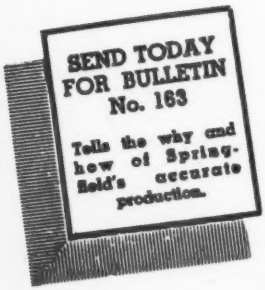
Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*



THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

Goodbye Guesswork!

Many of the new precision standards demanded in war industry are certain to be carried on in peacetime production.

They are going to mean better machines, better appliances, for living and working.

These close tolerances can be maintained only through constant use of gages, to check both tools and finished parts.

Gages bearing the PM Diamond Emblem bring you initial accuracy and the perfection of finish that insures long wear.

Pipe Machinery carries in stock a large assortment of standard plug, ring and thread gages from which prompt shipment can be made.

And we shall be glad to quote you prices and delivery dates on special gages to meet particular requirements.

ARMY E NAVY

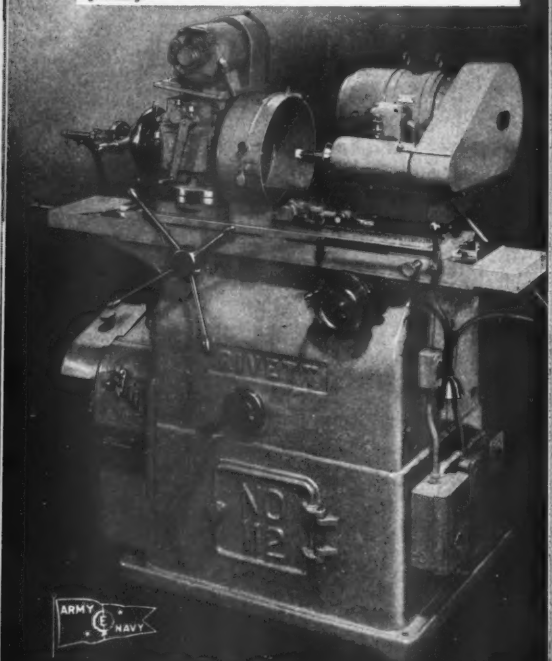
The PIPE MACHINERY COMPANY Cleveland, O.

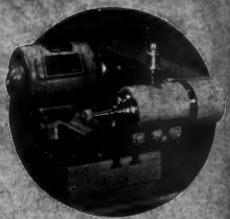
RIVETT

FOR STRAIGHT, TAPER, BEVEL OR STRAIGHT AND BEVEL GRINDING

The Rivett No. 112 Universal Precision Grinder is primarily for tool-room work. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Extreme simplicity of design enables any mechanic familiar with grinding to operate the machine.

Work may be held in collet, step chuck, jaw chuck or fixture and driven at required speed. Power table reciprocation may be set at one of eighteen selective speeds, from 10 to 86 passes per minute. Length of table travel is infinitely adjustable between ½" and 8". High or low speed internal bracket or external spindle bracket, all as illustrated, may interchangeably be mounted as required on cross slide. Workhead, table and cross slide are swivelled individually or in combination for taper and bevel grinding.





High Speed Internal Spindle

External Spindle and Tailstock

SPECIFICATIONS

Grinding cap., hole dia.	⅛" to 3"
Grinding cap., outside dia.	up to 8"
Automatic table travel	½" to 8"
Table speeds	18 selective
Hand table travel	18"
Swing over table	16"
Workhead swivel	90°
Table swivel	6°
Cross slide swivel	90°
Cross feed graduations	.0005"
Travel of cross slide	3½"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead spindle speeds	150, 380, 600 r.p.m.
Grinding spindle speeds:	
Standard int.	4800 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

For Further Description Write For Bulletin 112

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

WHAT HAS THIS TO DO WITH BROACHING?

THE Alcan Highway, hurled through hitherto inpenetrable forests, across mountains, rushing torrents and treacherous muskeg . . . all conquered by man and his machines . . . machines that owe, in great measure, their very existence to the elementary principle of the inclined plane. Used in ancient Egypt it enabled the engineers of the Pharoahs to move into position by sheer human effort the massive blocks of stone that formed the Pyramids. This same principle, upon development became the worm gear — that efficient instrument of power transmission — used in nearly every field of power application . . . without which our machine built civilization might well collapse.

EVEN as the principle of the inclined plane has influenced daily living in the widespread use of the worm gear, so also has Broaching, developed through successive phases from a crude beginning. Today, thousands of parts are made quicker, cheaper and better by modern applications of the broaching principle. In keeping with the trends of the past, even greater developments are in store for the world of tomorrow.

By driving steel balls, and later, crude drifts through the heated part . . . clever builders broached the hubs of the famed covered wagons.

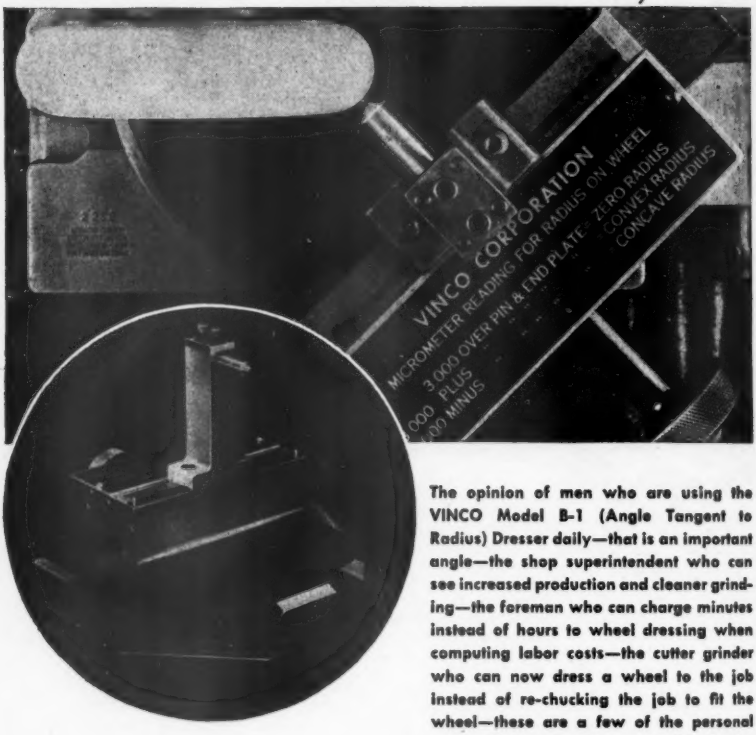
ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

MANUFACTURERS OF BROACHES AND BROACHING MACHINES

THERE ARE OTHER ANGLES, TOO


VINCO CORPORATION
MICROMETER READING FOR RADIUS ON WHEEL
3.000 OVER PIN & END PLATE - ZERO RADIUS
.000 PLUS CONVEX RADIUS
.000 MINUS CONCAVE RADIUS

The opinion of men who are using the VINCO Model B-1 (Angle Tangent to Radius) Dresser daily—that is an important angle—the shop superintendent who can see increased production and cleaner grinding—the foreman who can charge minutes instead of hours to wheel dressing when computing labor costs—the cutter grinder who can now dress a wheel to the job instead of re-chucking the job to fit the wheel—these are a few of the personal angles that are largely responsible for the rapid increase in the VINCO B-1 Dresser acceptance. Write us direct or consult our District Sales Offices for any further information.

Sub bases will be furnished (at slight additional cost) for most types of external and internal grinders. When ordering, specify the machine or machines on which the dresser will be used. This will enable us to advise you correctly on the type of base best suited to your specific needs.

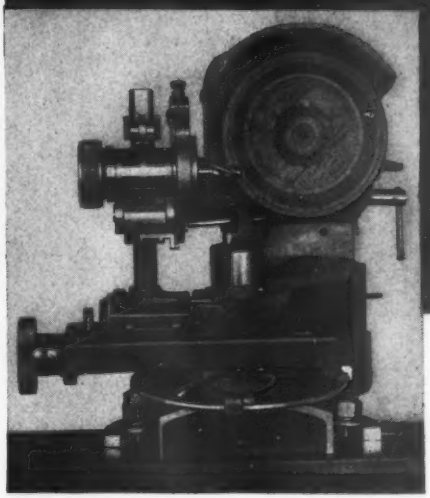
VINCO CORPORATION, 8873 SCHAEFER HIGHWAY, DETROIT 27, MICH.

SALES OFFICES— NEW YORK CLEVELAND CHICAGO

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Unitization and Distributor Units • Engineering, Design and Development

Radiform
TRADE MARK REG.



Simple, sturdy construction of Meyers Radiform insures fast operation and long, trouble-free performance.

* * *

Pat. Pending

Meyers Radiform Attachment for generating predetermined precision radii on spiral fluted end mills without previous wheel forming. Other Radiform attachments available for supporting tool bits, milling cutters, die sinking tools and other forming tools to be generated directly against a grinding wheel. Time and cost of forming wheels is eliminated.

Write, wire, or call for illustrated catalog and prices

Scully-Jones Tap Chucks

STYLE "A" TAP CHUCKS have five big advantages for driving taps:

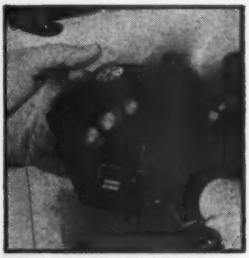
- Drive by the square—giving a positive drive.
- Centers by the shank—for correct alignment.
- Spring collet action—for locking tap in chuck.
- Four point bearing—giving collet action.
- A tapered shank—fits any MORSE TAPER HOLE.

RECOMMENDED FOR MAXIMUM RIGIDITY AND CONCENTRICITY IN TAPPING OPERATIONS

SCULLY-JONES AND COMPANY

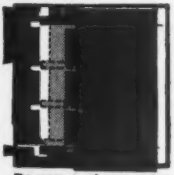
1901 SO. ROCKWELL STREET • CHICAGO, ILLINOIS, U.S.A.

Why Not SEE Rather than feel

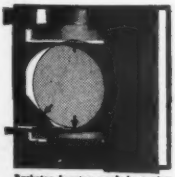


Weight of Gage and operator's hand rests upon the fixed contact. Gage is only ½" wide.

A light thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred direct to indicator.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

FEDERAL
INDICATOR SNAP GAGE
with Retractable Anvil
Adjustable for Size
No Lost Motion

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

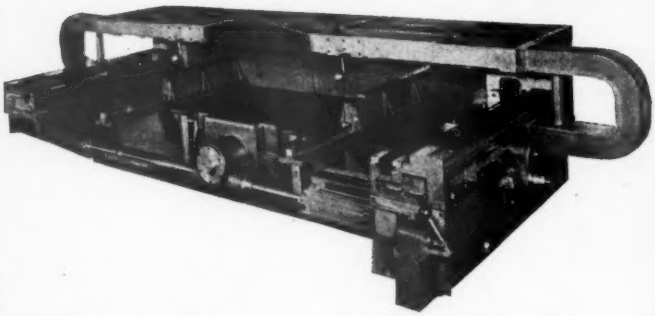
The Model 1330 P-100 has other advantages too — **The retractable anvil makes** it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only ⅝". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET PROVIDENCE 1, R. I.

★ ★ ★ ★ ★ FEDERAL ★ ★ ★ ★ ★

POTTS
MACHINE COMPANY

NO JOB TOO COMPLICATED



We are specialists in the manufacture of large complicated fixtures, such as the Automatic Positioning Loading and Unloading Drilling and Reaming Fixture, illustrated above.

No job too large or too complicated for our facilities.

We Solicit Your Inquiries

POTTS MACHINE CO., 2501 E. Michigan Ave., JACKSON, MICHIGAN

Builders of Tools, Dies, Jigs and Fixtures

NEW... Acro NEEDLE EYE LAPS For Small Diameters

Exclusive *Barrel-Shaped* "SLIT" Lap Prevents Bell-Mouthing of Small Holes

Small holes, straight or tapered, can now be more accurately finished with Acro Needle Eye Laps. These new, scientifically designed, tested and proven "slit" laps finish any type of small hole with a total elimination of bell-mouthing which is commonly caused by split-end laps.

Like the eye in a needle, the slit is supported at both ends by solid metal and can be spread to meet size requirements. This feature also provides a resilience that eliminates freezing against the work.

Acro Needle Eye Laps were designed by men like yourself, seasoned in the field of precision manufacture. And it is with their assurance, gained from their own experience, that Acro Needle Eye Laps will provide the best in lapping today.

TWELVE SIZES—EACH CAN BE EXPANDED TO MEET NEXT LARGER SIZE LAP

Small holes which may be finished with Needle Eye Laps range from .062" to .250" diameters. Simply choose a lap that is slightly smaller than the hole that is to be finished. Then spread the slot as desired with the special expander illustrated at right. Expanders are included with each shipment.

Acro Needle Eye Laps come in twelve sizes, and are packed a dozen of a size to a package. Each size can be expanded to meet next larger size.

Lap sizes: .062, .070, .079, .090, .104, .120, .135, .155, $1.50 dozen, $16.95 gross.

.1718 and .1875—$1.80 dozen, $20.50 gross.

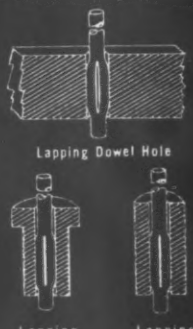
.2187 and .250—$2.20 dozen, $25.10 gross.

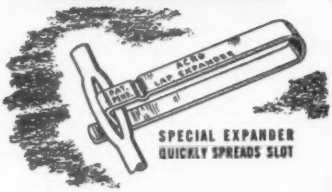
Complete Assortment $18.95 gross.

REMEMBER—it's the barrel-shaped, closed end SLIT lap that turns the trick . . . eliminates bell-mouthing.

ORDER NOW—IMMEDIATE DELIVERY

TYPICAL APPLICATIONS





Leading jobbers throughout the nation have ample stocks of Needle Eye Laps on hand in all sizes to make same day shipments.

See Your Jobber or Write —

ACRO TOOL and DIE WORKS

4894 N. Clark St. Phone Longbeach 1807 Chicago 40, Ill.

Change Over

TO SUPER-KOOL OIL-HOLE DRILLS *Today!*

. . . BECAUSE

1. SUPER-KOOL Oil-Hole Drills produce smoother holes.
2. The pressure of the oil forces the chips back through the flutes, eliminating the danger of scoring.
3. The constant supply of oil at the cutting edge keeps the drill sharp much longer, thereby reducing the expense of re-conditioning.
4. It speeds up deep-drilling tremendously, thereby reducing production costs.
5. The SUPER-KOOL Oil-Hole Drill has a life two to three times that of ordinary drills.
6. You CUT DOWN SPOILAGE LOSSES!
7. The SUPER-KOOL Oil-Hole Drill automatically clears away the chips.

PROMPT SHIPMENT

All sizes from 3/8″ to 3 1/2″ in diameter and up to 36″ overall.

DETROIT REAMER & TOOL CO.
2830 E. 7-Mile Road Detroit 12, Mich.

Manufacturers of

Oil Hole Drills Special Reamers
Circularity Relieved Reamers and End Mills
Also Special Tools

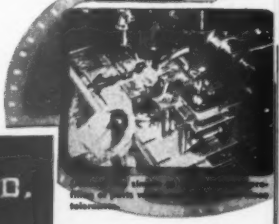
OIL-HOLE DRILL

See this New 30-Minute Movie and Save Months of Postwar Planning

(Above) Complex irregular shapes and contours are easily duplicated from inexpensive plaster models.

(Above) Flexibility of Duplicator [illegible] solves many industrial problems.

(Above) [illegible]



This new Gorton Sound Motion Picture, in colors—"An Exact Duplicate"—shows latest techniques on many jobs like those you'll tackle after "V-E Day."

Yes, the 30 minutes that you'll spend seeing "An Exact Duplicate" may give you the practical solution to that tough postwar production problem that is on your drawing board today. This motion picture, filmed in color and sound under actual machine shop conditions, shows Gorton Tracer-Controlled Machines *in use* on plastic die and mold jobs, forging dies, high production profiling, milling, 2 and 3 dimensional engraving and manual and electric duplicating.

Available now without charge—for showing to technical societies, company groups, conventions, training schools, and other organizations. Write us today for further information, giving choice of three tentative dates.

GEORGE GORTON MACHINE CO.

1210 RACINE STREET, RACINE, WISCONSIN, U.S.A.

HOVIS UNIVERSAL MASTER WASHER DIES

Purchased for War Production can be used for . . . POST-WAR EQUIPMENT!

● Each Hovis Universal Master Washer Die is made on an all-steel precision standard die set which comes complete with stock gauges and stops. The Master Dies themselves can be used after reconversion.

THE MASTER DIES THEMSELVES DO NOT BECOME OBSOLETE

THE 5 EASILY REMOVABLE PARTS are all the TOOLING required to make a new size washer

DETAIL NO. 6 Piercing Punch for inside diameter of washer.

DETAIL NO. 9 Button Die for blanking outside diameter of washer.

DETAIL NO. 13 Compound Blank, Punch and Pierce Die.

DETAIL NO. 8 Knockout, to remove washer from die.

DETAIL NO. 19 Stripper Bushing to strip stock from compound.

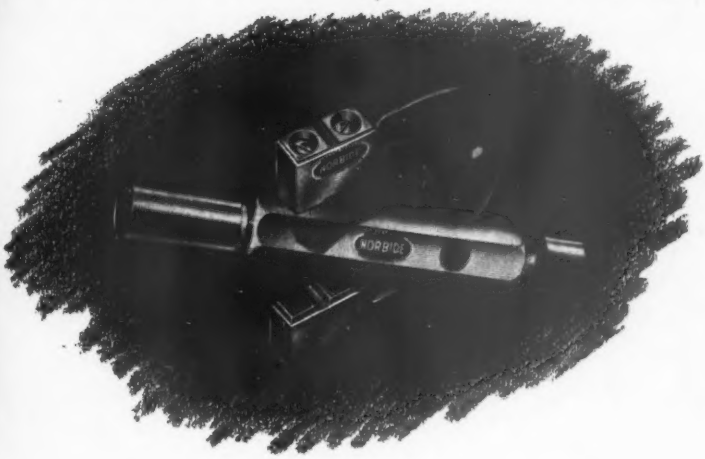
● Once having made your investment in Master Dies, the 5 small interchangeable parts are all you need to buy to make any size washer for your new product. Write for illustrated circular explaining in detail the simplicity and economy of this method.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Suburb of Detroit

VAN DYKE, MICHIGAN
Phone: Centerline 1575

NORBIDE* Gages Last Longer



NORBIDE Gages last longer—100 times and more—than conventional types of measuring devices. For NORBIDE (Norton Boron Carbide) is the hardest material made by man and, therefore, it possesses great resistance to wear. Furthermore, NORBIDE gage members will not pick up lint nor become charged with particles of metal.

Norton Company supplies NORBIDE gage blanks to gage manufacturers and to concerns making their own gages. Ask your regular gage manufacturer for NORBIDE gages and prove to yourself how the hardest material made by man increases gage life 100 times and more.

Or if you wish additional information write to Norton Company and for interesting information on NORBIDE gages request booklet No. 1100.

NORTON COMPANY • Worcester 6, Mass.

Hardest Material Made by Man

JIGS AND FIXTURES

We have been building jigs and fixtures for a good many years. We are proud of the fact that some of our oldest and most regular customers are leading manufacturing and production plants. We have continued to do job work for many of these plants right through the war period.

Our shop is better equipped now than ever to build your jig and fixture requirements. We invite you to try Star workmanship and service.

Designers and Builders

OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

STAR
MACHINE & TOOL COMPANY

9320 Woodland Ave • Cleveland 4, Ohio

Delta Machine Tools

serve you far beyond normal expectancy

because of these *Quality* features

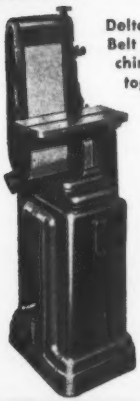
1. **Double-sealed New Departure ball bearings** — Keep out abrasive shop dust. The proper type and amount of lubricant is "sealed-in" at the factory for the life of the bearing.
2. **Pre-loaded bearings** — Eliminate unnecessary play — provide extra rigidity — reduce vibration — and prolong life.
3. **"Diamond-bored" seats** *(precision-bored)* — Attained by a rigid boring bar that does not deflect under pressure, and by precision mounting of the bar in the boring head.
4. **Balanced pulleys** — Highly accurate balancing prevents the transmission of belt-pull to spindle — reduces spindle wear and vibration.
5. **Precision-ground shafts** — Through expert grinding to close tolerances, shafts run true, smoothly and without vibration.

. . . and here are the machines themselves *TURN THE PAGE*

Delta Floor-Type Multiple-Spindle Drill Presses
4-spindle model illustrated. 2-spindle model also available with one-piece table. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle.

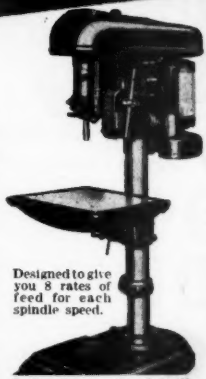
Delta 14" Floor-Type Drill Press
Delta's patented construction provides *both* a self-aligning drive and a free-floating spindle. Features include smooth-working table-raising mechanism, built-in depth gauge, streamlined safety belt guard.

Save *Time* and *Money* on with low-cost, dependable



Delta 6" Abrasive Belt Finishing Machine gives you top efficiency
Handles dozens of sanding, polishing, and finishing operations. Set horizontally with wood fence for edge or face sanding, or used vertically in connection with the 7½x14¾" tilting table. Completely equipped with double-sealed ball bearings.

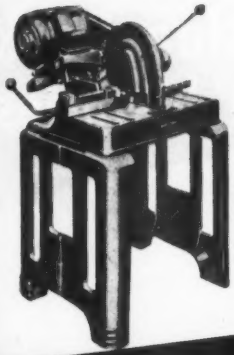
Delta 14" Metal-Cutting Band Saw
This low-cost, high-quality machine cuts anything from carbon steel to asbestos — has dozens of uses in the general tool and machine shop, also the pattern shop (4 metal-cutting speeds, 1 wood-cutting speed). *Simple, foolproof gear drive.* Guides give micrometer accuracy with independent adjustments.



Designed to give you 8 rates of feed for each spindle speed.

Delta Power-Feed Drill Presses
Instant switching from heavy power-feed operations to sensitive hand drilling. Available in 24 different models.

DELTA-MILWAUKEE . . . *pioneers of small, compact,*

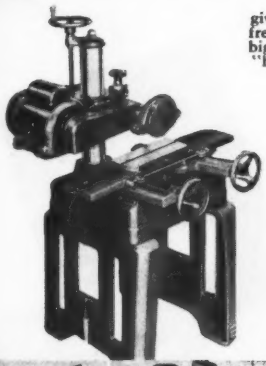


Delta Cut-Off Machine eliminates expensive finishing
Cuts plastics, non-ferrous metals to exact length with polished smoothness.

Delta Carbide Tool Grinder Runs True
Free from vibration, for delicate grinding of carbide-tipped tools.

Delta Grinder with Twin-lite Shields
gives you extra convenience, efficiency, safety. Safety Shields act as "built-in goggles."

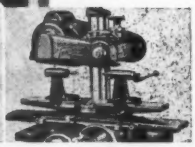
post-war retooling DELTA Machine Tools



Delta Toolmaker Surface Grinder
gives dependable, trouble-free results. This husky, big-capacity grinder is a "heck of a lot of machine for the money," say delighted users. Ideal for surface grinding, tool sharpening, etc.

Has many features that assure you creditable performance.

With the Univise and the coolant attachment, it becomes a dependable Chip-Breaker Grinder for grinding the chip-breaker groove on carbide-tipped tools.



With the Unihead and the tool and cutter grinder attachment, it becomes the latest development in Tool and Cutter grinding. Simple, accurate, and very low in cost.

DELTA MILWAUKEE Machine Tools

SEND FOR CATALOG

Coupon on next page

durable, low-cost machines for heavy-duty production work

Delta's 76-Page Blue Book gives you 140 case histories

of special machines with Delta components

...demonstrating how you can break Reconversion bottlenecks!

You save time and money with low-cost special purpose machines built from standard Delta units . . .

Illustrated and fully explained are many ingenious combinations built with Delta components that give your production staff a running start in post-war re-tooling and change-overs. You save time by avoiding long shut-downs during re-tooling — you save money by eliminating the cost of purchasing bulky, space-consuming machines that may take months before delivery is made.

Send for your free copy today and see how you can adopt these modern methods to your particular problems.

M-11A

THE DELTA MANUFACTURING CO.
613L E. Vienna Ave., Milwaukee 1, Wis.

Please send me my free copy of your new 76-page Blue Book, and Catalog of low-cost Delta Tools.

Name_____ Position_____

Company_____

Address_____

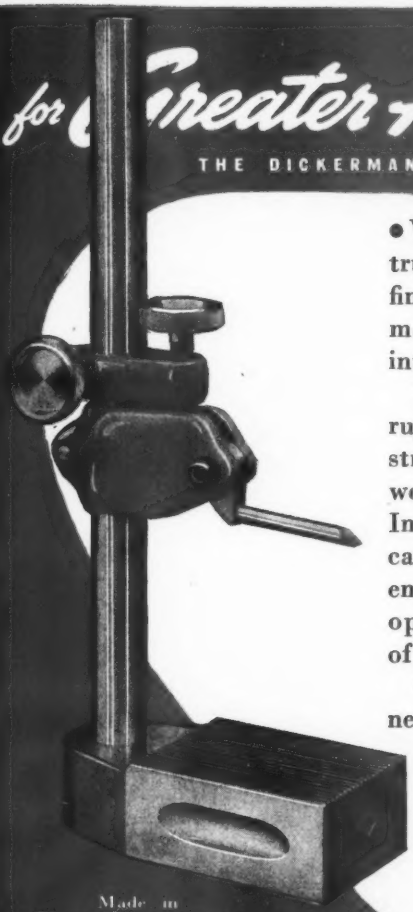
City_____ (__) State_____

Tear Out and Mail Coupon

Send today for your free copies of these valuable books. Consult your Delta-Milwaukee distributor regarding deliveries.

for Greater Accuracy

THE DICKERMAN HEIGHT GAUGE



Made in
Three Column Lengths
10" — 14" — 18"

• Words or pictures cannot truly describe the inherent fineness of quality and workmanship that we have built into our Height Gauge.

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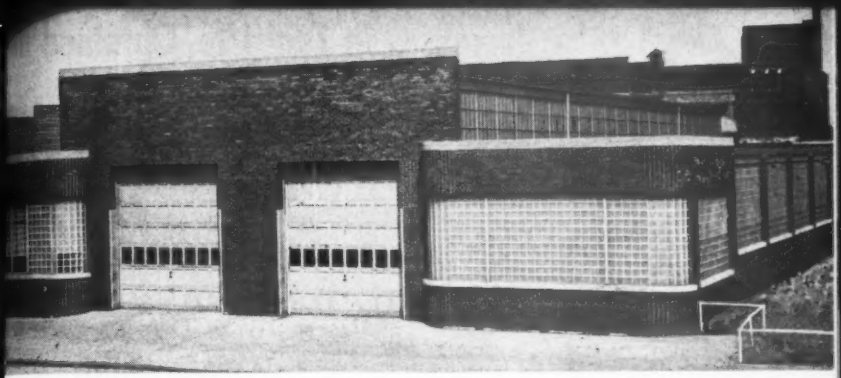

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Drilling 328 holes in aluminum airplane fin	No. 29 drill	112	280	150%
	No. 11 drill	54	108	100%
	¼" drill	82	164	100%
	No. 41 drill	144	288	100%
Drilling 16 holes in chrome moly steel motor mount	No. 43 drill	8	50	525%
Drilling 12 holes in chrome moly steel side plates of motor mount	Combination 2¾₄" drill and ⅜" reamer	60	140	133%
Drilling 2 stainless steel parts	F drill	200	300	50%
Drilling holes in back board for gun turret	No. 30 drill	10	32	220%
Average Increase in Tool Life on 6 Typical Jobs in This Plant...				165%

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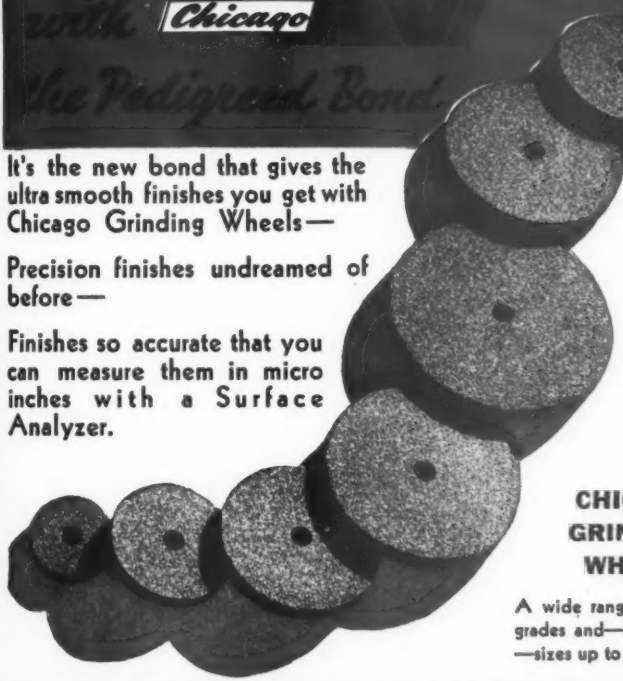

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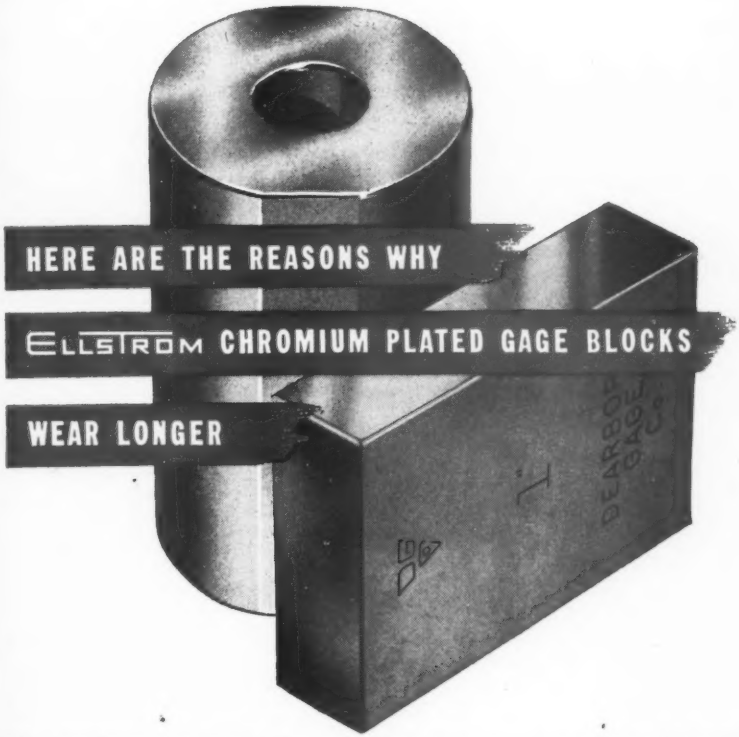

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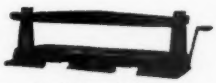

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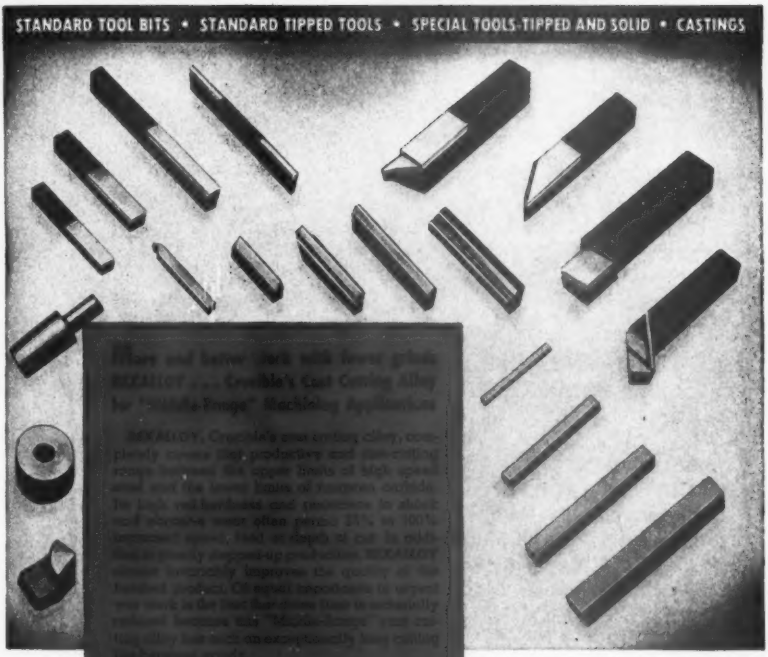

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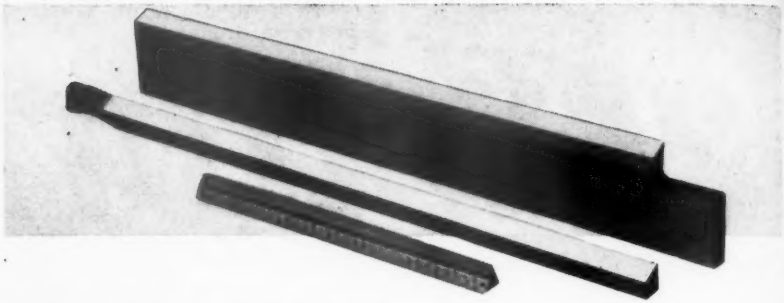

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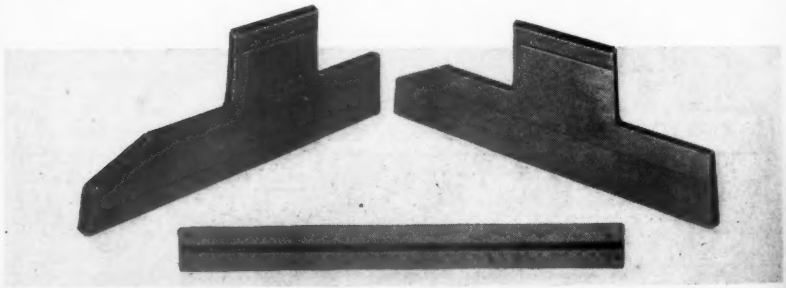

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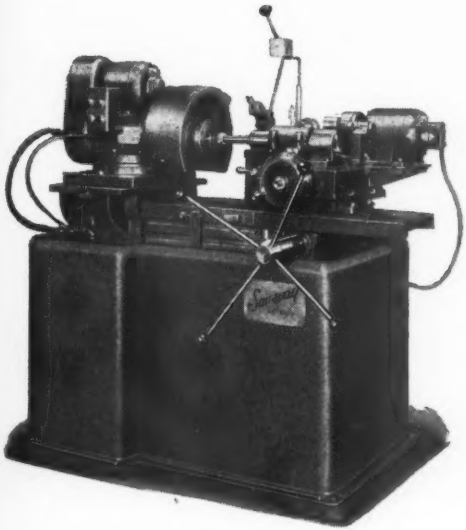

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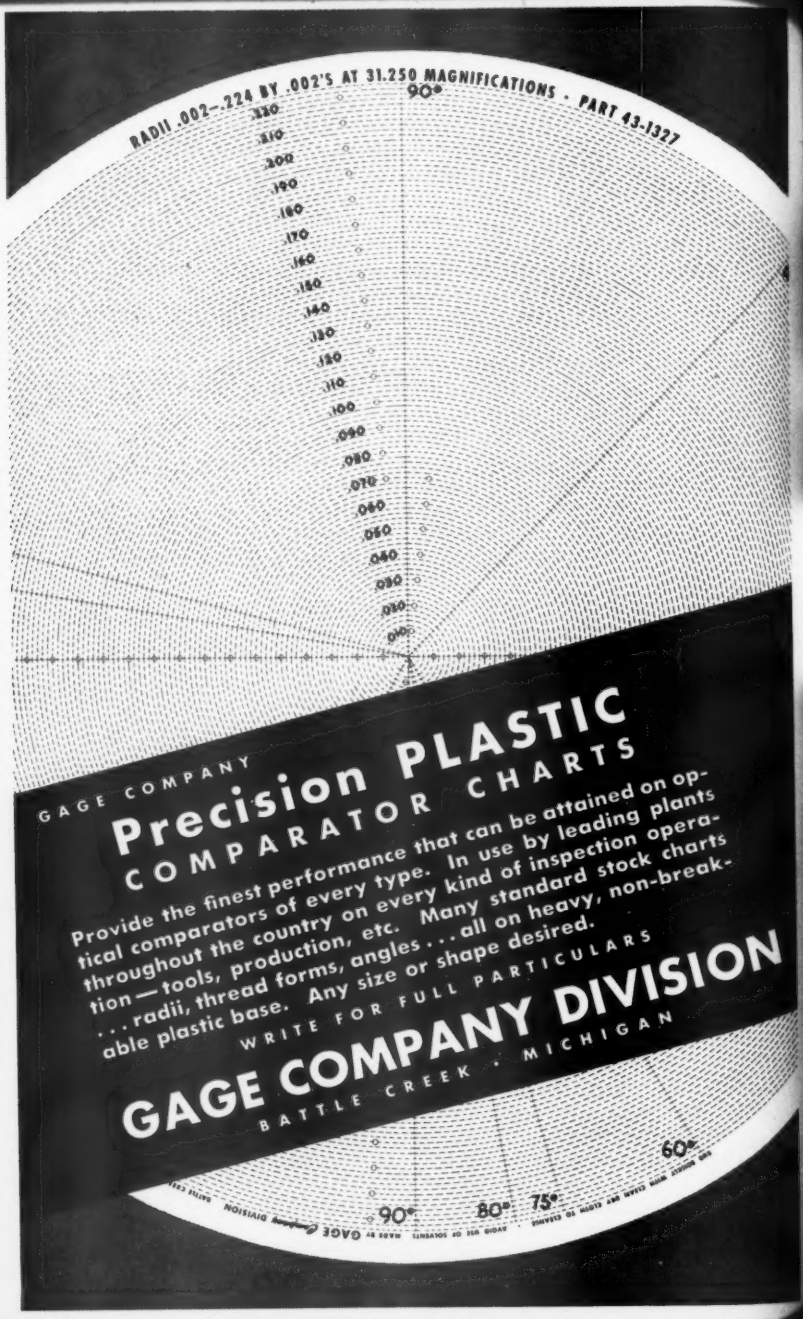
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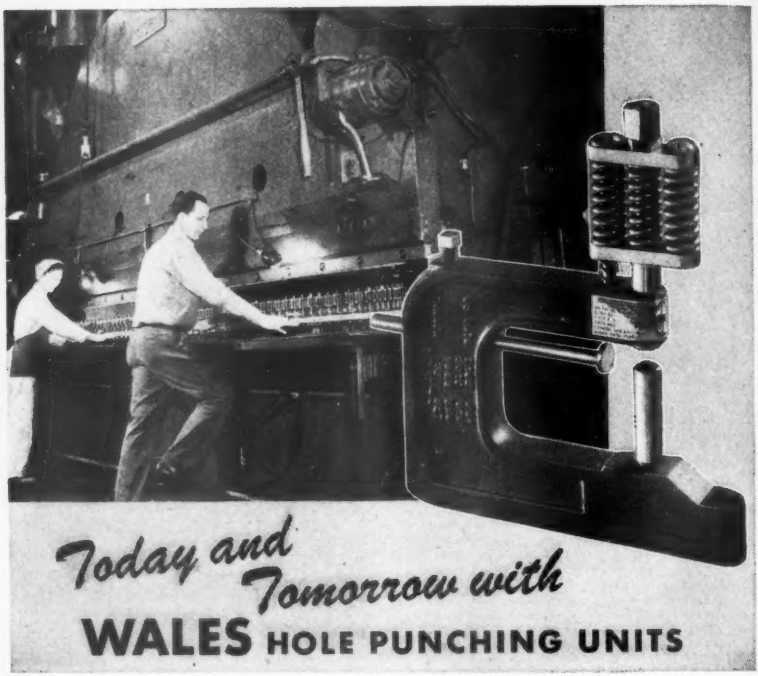

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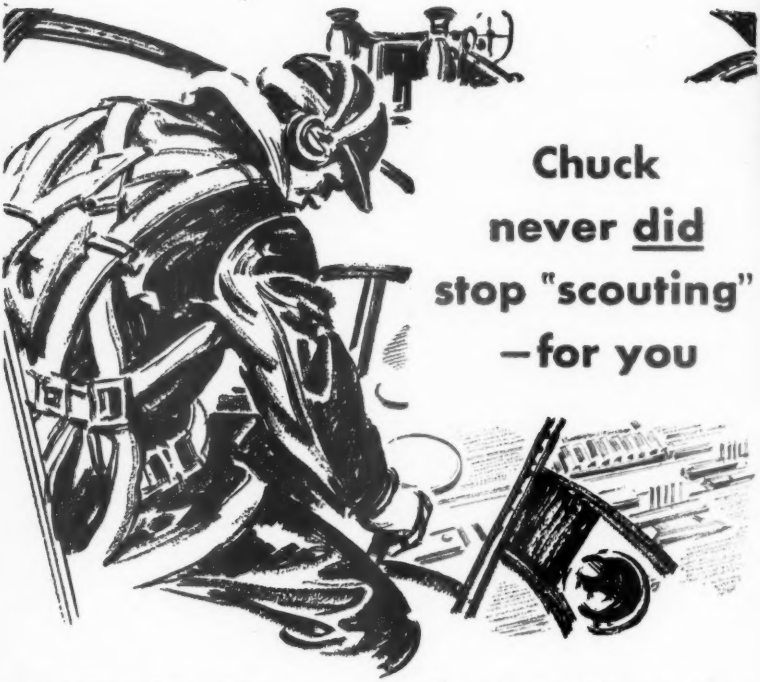
Precision Tap Selecting & Specifying, by R. R. Williams
Three Dimensional Drawing, by L. E. Sanders
A Plastic Tooling story by W. Brandt Goldsworthy
A Time Estimate for a Compression Mold, by Gordon B. Thayer
Design of Plastics Parts and Molds, Part III, by Warren V. Prince



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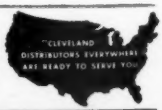


TOOL & DIE INDUSTRY ON ALERT

It is next to impossible to exaggerate the importance of tooling as it has been developed for American production. It is reasonably safe to say that every industry, in fact practically every manufacturer who has made notable progress in production development during the last twenty-five or thirty years, has done so as the result of more careful attention to the design and construction of tooling.

It may be true that parts can be processed and assembled into complete units with only a minimum of precision tooling, but it cannot be denied that when competition between manufacturers in the same industry stiffens, it is the most carefully tooled product which usually assures its manufacturer the most satisfactory sales volume at a competitive price and yet with a reasonable profit.

Before the war, broadly speaking, sales appeal of a given product depended upon two factors: (1) eye appeal, and (2) mechanical or structural excellence; and this will just as surely be true in our post-war industrial era. Both result from the use of ingeniously conceived and designed tooling precisely built and carefully used in production.

We have written frequently about this dependence of mass production upon such precision tooling and we have been gratified beyond words to note the ever-increasing emphasis which American industry places upon it. Today we stand before the partially opened door which leads to industrial reconversion. Planning by some manufacturers may be well under way, but the consummation of such planning which must carry us to employment totals never before achieved in normal business periods is far from completion. A huge potential buying power apparently had been built up, the rapid conversion of which into wages, salaries and business profits and its continuance in increasing volume for several years to come is the responsibility of every industry and every individual member of it.

Recognition of this fact is always gratifying. Therefore, we feel justified in calling attention to the annual meeting of the National Tool and Die Manufacturers Association held last month in Cleveland. The owners and executives of the contract tool, die and mold shops which constitute the membership of this organization realize that they have just as great a responsibility in our country's orderly and rapid reconversion to peace-time manufacture as they had in the ter-

Richard F. Moore

rific transition to war production. Committees to study and recommend apprenticeship programs adaptable to the period of reconversion, and others to bring recommendations for the establishment of just labor and governmental relations are being appointed.

In recognition of the industry's responsibility, the members adopted policies which included continuing application in the highest possible degree to the speedy and successful culmination of the war and the maximum use of precision tooling in the reconversion period thus assuring the fullest possible utilization of the industry's facilities. It is significant that the output of one worker in a tool and die shop can frequently provide tools which will employ as many as one hundred production workers for a considerable period of time.

New directors and officers were elected. L. A. Sommer, president of The Sommer & Adams Company of Cleveland, credited with the founding of the Association, and its first President, was succeeded by Richard F. Moore, president of the Moore Special Tool Company, Inc., of Bridgeport, Conn. Other officers elected were: vice-president, Willis G. Ehrhardt, president of Ehrhardt Tool & Machine Co., St. Louis, Mo.; treasurer, H. F. Jahn, president of The B. Jahn Manufacturing Co., New Britain, Conn.; and secretary, Ben Buerk, president of Buerk Tool Works, Buffalo, N. Y.

The Board of Directors is comprised of: Carl A. Ericcson, president of the Erickson Machine Works, Inc., Minneapolis, Minn.; K. Janiszewski, president of the Superior Steel Products Corp., Milwaukee, Wis.; Eugene J. Rowan, Jr., Nelpin Manufacturing Co., Long Island City, N. Y., who also has been named New York Director of the Association; L. A. Sommer, Cleveland; W. J. Tallmann, National Tool and Machine Company, Rochester, N. Y., and William R. White, Jr., vice-president of the Midwestern Tool Company, Chicago, Ill.

An important step was the decision to move the Association's headquarters from Washington to Cleveland, an action taken because the organization can be of greatest assistance to its own members and to those of all other industries by having its headquarters conveniently located in the field of operations.

Geo. J. Hubner

Editor

HARD-FACING MATERIALS APPLIED TO TOOL WORK

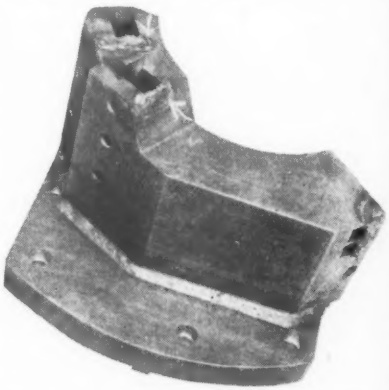
by C. E. Phillips, Pres.
C. E. PHILLIPS & COMPANY
Detroit, Michigan

An understanding of the properties and of the correct procedures for applying the numerous hard-facing materials will be helpful in many of the emergencies which arise in the tool and die room. This understanding is so important that any attempt to proceed without it is practically certain to be futile.

First among things to be established is that several different types of hard-facing material in any one family or brand are necessary in order to meet the requirements of different applications. Because of differences in composition each type will act differently under the heat of the torch or arc. Also, even slight changes in the proportions of the same alloying elements will cause changes in the melting point, hardness as deposited, toughness, etc. For example, increasing the carbon content of steel lowers the melting point and increases the hardness.

It is not necessary for the welder to be a metallurgist in order to do a satisfactory job of hard-facing. The manufacturers of these materials have performed an endless amount of laboratory experimentation to learn the effects of various procedures, and to determine the best method of application for each type. And they provide plenty of information on which material to use for each given application, with complete explanations of the best application techniques. The first step toward successful hard-facing is therefore to recognize that any hard-facing material needs to be deposited according to the instructions furnished for that specific material. If difficulties are encountered, expert advice can be obtained from the manufacturers of the hard-facing metal. A totally inexperienced operator who is willing to learn the individual techniques of all materials will consistently do a better job than any expert who approaches hard-facing with a closed mind.

Second, and no less important, is an understanding of the importance of hardness. It should be remembered that most tool and die steels acquire hardness through heat treatment, whereas hard-facing materials are hard as deposited, and the heat treatment of these deposits is rather to be avoided. Also, hard-facing materials are designed for wear resistance, with hardness a secondary property. Generally speaking, the hardness of both heat-treated alloys and hard-



The three critical points of wear on this built-up tool holder are protected by small applications of a hard-facing material.

A built-up tool holder body before machining.

facing alloys is spoken of in terms of Rockwell C and will vary according to the type of material, from Rockwell C 30 to Rockwell C 60.

In the development of hard-facing metals, the factor of most importance is the ability of the alloy to withstand severe abrasion or wear. However, the applications to which hard-facing alloys are now put vary to such a large degree that it becomes imperative to combine properties other than wear resistance in their make-up. Resistance to impact, resistance to heat and resistance to corrosion are properties which are very essential. The fact that a hard-facing alloy is to be subjected to severe impact does not mean that it must be of the softer variety.

A great deal of experimental work has been done relative to the question of hardness and its apparent importance in resistance to abrasion. These tests have been made both experimentally and on practical applications. The results indicate quite conclusively that hard-facing materials which have a hardness of Rockwell C 45 withstand wear and abrasion in ratios of from two to one to as high as ten to one over the best quality heat-treated alloys having Rockwell C Hardness as high as 65.

The hardness of any hard-facing material is an indirect property, resulting from the attainment of the desirable amount of wear resistance in combination with other properties essential to the alloy for a particular application. The wear resistance of any alloy depends not only on the amount of alloying element or elements contained, but also depends on the particular kind of alloy. Taking into consideration other factors such as heat, impact, corrosion, etc., the question of which one will wear the greater length of time is naturally much more important than the hardness of the hard-facing alloy used. If the hardness were the deciding factor in facing metals, then it would only be necessary to obtain a steel which could be heat-treated.

It is quite common to have serious complaints of the inability of the machinist to grind the material without taking a great deal of time and without considerable wheel consumption. In this connection, it should be remembered that hard-facing alloys have been developed to resist the action of grinding wheels (which is one type of abrasion) to the maximum extent. Consequently it is to be desired that the hard-facing material be as difficult to grind as possible in order that the facing shall resist the wearing action for which purpose it was intended. It is significant that the diffi-

The deposit on these V-block inserts is extremely hard but can be ground without danger of cracking or of encountering porosity.

Feed blades faced with a deposit containing fine particles of tungsten carbide.

culty of grinding has little or no connection with the hardness of an alloy. It is possible, however, to get a rough estimate as to the *wearing* properties of various hard-facing materials by a comparative grinding test, which, however, will not indicate the actual or approximate hardnes in comparison with the hardness of various alloys and heat-treated steel.

Characteristics which make hard-facing materials desirable for use at points of wear are necessarily combined with characteristics which make them unsuitable for structural purposes. That is, the main body of a part is best made of a suitable steel (machine steel, for example) and with the hard-facing applied only where wear occurs. Obviously a new part will last longer if the points of wear are hard-faced in the beginning, and worn parts can be made as good as new, or better, by building up the worn areas with the correct material. It is necessary to recognize that the alloy steels vary in their reactions at high temperatures, and to adapt the application procedure in each case to the characteristics of the parent metal.

Application of hard-facing materials to low carbon and medium carbon steels (up to 0.55% C) requires no heat treatment either before or after. High carbon and tool steels should be in the annealed or as rolled condition when the deposit is made, then heated to 1600° F before the weld cools, and allowed to cool normally in still air. The high chrome alloys require heating to 1200° F before making the deposit, and the cooling should be retarded. These details of procedure do not conflict with the statement previously made that hard-facing deposits require no heat treatment, because in all of these cases the treatment specified is partly for the benefit of the parent metal and partly to avoid undesirable brittleness or checking in the fusion zone. In no case is it desirable to use a heat treatment involving a quench.

Compared with ordinary steel welding rods and electrodes the hard-facing materials may appear to be more costly. This is due to the cost of the materials of which they are compounded and to the special procedures involved in manufacturing them. However this cost is offset to a large extent by the fact that so little is used for the average application. On tool and die work the best economies are realized by making comparatively thin deposits, thereby saving material and reducing the amount of necessary grinding. The latter is important because these deposits are by their nature not easy to grind.

Probably the commonest error made in the use of hard-facing materials is the assumption that one deposit technique is suitable for all of them. That is decidedly not the case. Some of them should be deeply fused with the parent metal and others are best applied with a very minimum of penetration. Therefore each application needs attention to (1) the degree of penetration recommended for the hard-facing material used, and (2) the heat treatment recommended for the parent metal.

Some examples of hard-facing applications in tool and die work are illustrated. Figure 1 is a tool holder built up of machine steel parts by arc welding. The square holes were made by machining grooves in mating parts, then welding those parts together with a carbon steel electrode so that the holes were completed by the assembly welding.

The photograph shows clearly that after the body of the holder was machined, there was no trace of the assembly welding. A similar job, before machining, is shown in Figure 2. The heavier section in Figure 1 was arc welded to the flame-cut base with a mild steel electrode. Then the points of greatest wear were faced with arc welded deposits of Stoodite, which is an alloy of chromium, manganese, zirconium, silicon, carbon and iron. It is cast in rod form, and coated for arc welding application. In the bare form this alloy can be applied by the oxyacetylene method. The deposit has high wear resistance and toughness, makes an excellent bearing surface and resists galling; and is therefore indicated for metal wear caused by sliding friction. It can be finished to a smooth highly polished surface. When deposited by the electric arc as in the case illustrated, the Stoodite electrode is used positive (reverse polarity); and because it solidifies relatively slowly the deposit must be watched to see that the desired height of bead is maintained. In this application, the

(TO PAGE 214—PLEASE)

TOOL ROOM SURFACE GRINDING · Part IV

by J. E. Corbett

Compound Angles

Surfaces that are identified, located and expressed by compound angles, as in Figs. 16, 17 and 18, are often most difficult to visualize and are not always easy to solve. Here the reader must realize that compound angles are commonly designated either as shown by the angles X & Z, or by X and a clearance angle Y which is in a plane perpendicular to the edge AE. The latter two angles are practically always used to specify the shape of form cutting tools; whereas, angles X & Z are generally used to express the compound angle requirements on other types of work. *Thus in any problem, it is most important to determine whether the required angles are X & Y or X & Z.*

The illustrations, Figs. 16, 17 and 18, are of a rectangular block, assumed to be transparent, with the edges RS, SU & SB dotted only to prevent the optical illusion of inversion. The plane AEGH is shaded to aid perception and, in Figs. 16 and 18, the shading also shows the path of the wheel.

For this article, all the drawings are lettered according to a definite system so the reader may go from one to the others without confusion. While there is not space for a full description of the formula development, these related drawings may be useful to those who are interested in the geometry of compound angles.

Methods

There are three more or less common methods of setting up the rectangular block to grind along the surface AEGH. These methods are illustrated in Fig. 19. The special equipment required is:

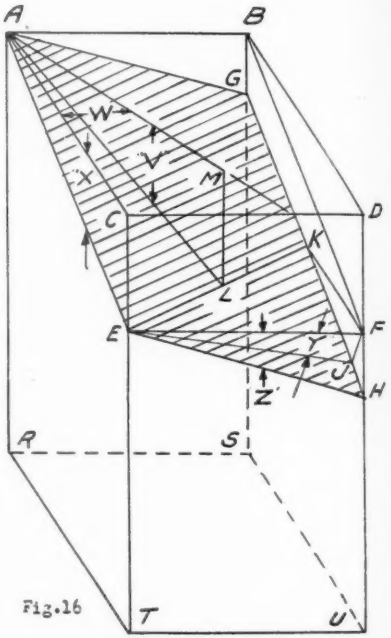


Fig. 16

Method 1—
Protractor and angle wheel dresser, or
Protractor and sine plate, or
Compound vise.

Method 2—
Compound vise, or
Compound sine plate.

Method 3—
Sine plate and angle wheel dresser, or
Vertical circle vise and angle wheel dresser.

In order to follow the outline for each of these methods as shown in Fig. 19, it may be necessary to solve for the angles required, particularly for Method 1. The following formulae cover any necessary calculations:

(1) Tan Z = Tan Y Sec-X
(2) Tan Y = Tan Z Cos X
(3) Tan W = Tan Y Csc X
(4) Tan W = Tan Z Cot X

(5) Tan V = Tan X Sec W
(6) Tan P = Tan X Cos Z
(7) Sin P = Sin X Cos Y

Example 1.

Grind a tool with these angles: X = 30° and Y = 7°, which are typical for a standard 60° threading tool.

Method 1, Fig. 16—

From formulae (3) and (5) above, solve for the angles W and V as follows:

(3) Tan W = Tan Y Csc X
= Tan 7° Csc 30°
= .12278 x 2.0000
= .24556
W = 13° 47′48″

(5) Tan V = Tan X Sec W
= Tan 30° Sec 13° 47′48″
= .57735 x 1.0297
= .59449
V = 30° 43′ 52″

Method 2, Fig. 17—

If X and Y are given as stated above no calculations need be made. It is only necessary to follow the instructions under Method 2 in Fig. 19, using angles X and Y as given. Had Z been stated instead of Y, solve for Y by formula (2).

Method 2A, Fig. 18—

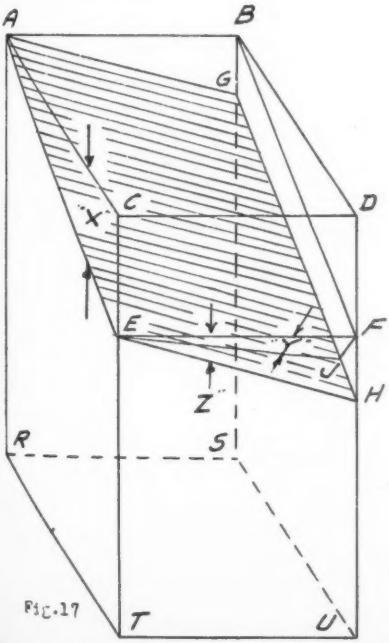


Fig. 17

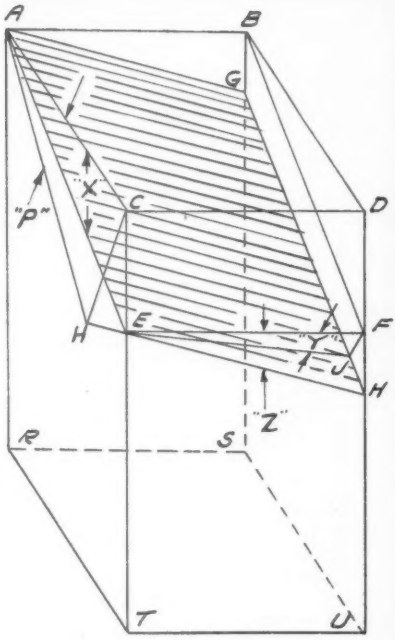


Fig. 18 The plane AHC is not on the surface of the block, but is swung out from ACRT to make the angle HCE equal to the angle Z.

Solve for angles Z and P as shown in Method 3.

Method 3, Fig. 18—

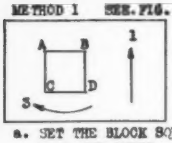
Solve for Z and P by formulae (1) and (7).

(1) Tan Z = Tan Y Sec X
= Tan 7° Sec 30°
= .12278 x 1.1547
= .14177
Z = 8° 04′08″

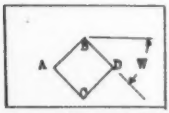
(7) Sin P = Sin X Cos Y
= Sin 30° Cos 7°
= .50000 x .99255
= .49627
P = 29° 45′12″

Of course the operator will decide before he begins which method he will use and, at the most, will have only two equations to solve. With very little practice, setting up for compound angle grinding becomes a simple job, but it is necessary to follow instructions particularly with reference to setting angle X on the top segment as shown in method 2.

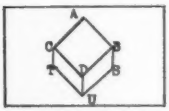
METHOD 1 SEE FIG. 16



a. SET THE BLOCK SQUARE WITH THE CHUCK.



b. ROTATE THRU ANGLE W IN DIRECTION OF ARROW 3.

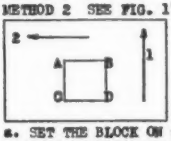


c. DRESS ANGLE V ON THE WHEEL.

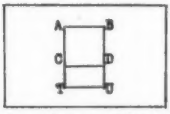
OR

c. TILT THRU ANGLE V IN DIRECTION OF ARROW 1 AND GRIND WITH STRAIGHT WHEEL.

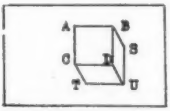
METHOD 2 SEE FIG. 17



a. SET THE BLOCK ON COMPOUND VISE OR SINE PLATE SQUARE WITH THE CHUCK.



b. TILT THRU ANGLE X ON TOP SEGMENT OF VISE OR SINE PLATE IN DIRECTION OF ARROW 1.



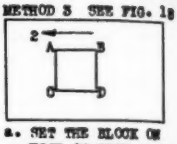
c. TILT THRU ANGLE Y ON LOWER SEGMENT IN DIRECTION OF ARROW 2.

METHOD 2a SEE FIG. 18

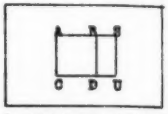
b. TILT THRU ANGLE Z ON TOP SEGMENT IN DIRECTION OF ARROW 1.

c. TILT THRU ANGLE P ON BOTTOM SEGMENT IN DIRECTION OF ARROW 2.

METHOD 3 SEE FIG. 18



a. SET THE BLOCK ON VISE OR SINE PLATE SQUARE WITH THE CHUCK.



b. TILT THRU ANGLE Z IN DIRECTION OF ARROW 2.

c. DRESS ANGLE P ON THE WHEEL.

METHOD 3a. SEE FIG. 17

b. TILT THRU ANGLE X IN DIRECTION OF ARROW 2.

c. DRESS ANGLE Y ON THE WHEEL.

FIG. 19

If the bottom axis were used to develop angle X, the setting would be angle P; and, the angle Z would then need to be set on the top element in order to get angle Y on the block. This is because if X is set on top, the edge AE is parallel to the chuck and likewise parallel to the axis of the lower segment. Now AE will remain parallel to the chuck regardless of any movement of the lower member. However, if X were set on the lower member and AE thus made parallel with the chuck, this relation would be disturbed when the upper plate is moved to set the other angle. Some experiments may be required to enable the operator to visualize this situation.

Example 2.

Grind a form tool as shown in Fig. 20 and determine the angle Y for the left side to be such that GA is perpendicular to the base, so that as the tool is ground on the top surface for sharpening, it will retain its form and maintain a constant length AE or AE'. These angles are given:

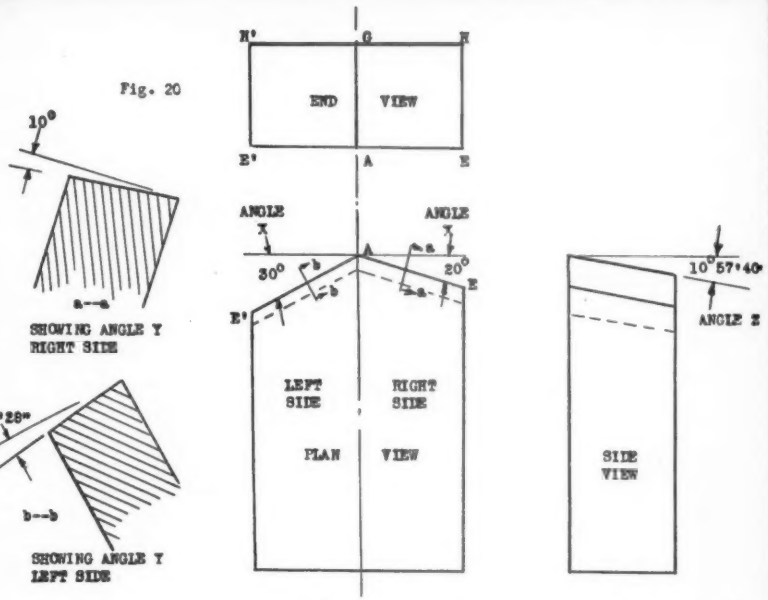
Right $X = 20°$ $Y = 10°$ Left $X = 30°$ $Y = ?$

An examination of this problem shows that the angle Z must be the same for both sides of the tool. In other words, the surface AEGH and AGE'H' must intersect on a *vertical* line GA. Since GA defines the angle Z, it will then be the same for both sides of the tool.

If $X = 20°$ and $Y = 10°$ on the right side, then

(1) $\text{Tan } Z = \text{Tan } Y \text{ Sec } X$
$= \text{Tan } 10° \text{ Sec } 20°$
$= .17633 \times 1.0642$
$= .18765$
$Z = 10° 37'40''$

Fig. 20



So for the left side X = 30 and Z = 10° 37'40".

(2) Tan Y = Tan Z Cos X
= Tan 10° 37'40" Cos 30
= .18765 x .86603
= .16151
Y = 9° 10'28"

This gives angles X, Y and Z for both sides of the tool. It can now be set up for any of the three methods by calculating the other necessary angles as shown in Example 1.

MATERIAL WEIGHT TABLES, Part VI

These tables will reduce to a minimum the work of calculating the total weight of steel (based on a steel of 1 cu. in. = .2836 lb.) required for a given press run. At the same time they are readily applicable for other materials and purposes.

Use of the tables is accomplished with simplicity and speed. Example: given a job that is to be blanked out of strip stock 11⅜" wide, with a "pitch" or length of stock feed per blank of 6", and an assumed stock thickness of .022". In the column headed by 11⅜" we find the constant 19355.70 opposite 6". Multiplying 19355.70 by .022 gives 425.8 +, or 426 as the weight in pounds for 1000 pieces 11⅜" x 6" x .022".

Suppose, however, that the stock requirement was 11⅜" x 6⅞", same thickness: In such a case, we refer to the same column headed by 11⅜", and, to the constant given for 6" we add the constant shown for ⅞", or 19355.70 + 2822.71 = 22178.41. This new constant multiplied by .022 gives 488 lbs. as the weight of 1000 pieces 11⅜" x 6⅞" x .022".

The tables will serve for weight calculations of any material by multiplying the weight of the stock in steel by the appropriate conversion factor. For instance, in the example given for steel 11⅜" x 6⅞" x .022" weighing 488 lbs. per 1000 pieces, multiplying the steel weight by 1.136 gives the stock weight requirement for the same job in sheet copper: 488 x 1.136 = 554 +, the weight in lbs. for 1000 pieces of copper 11⅜" x 6⅞" x .022".

MATERIALS[1] WEIGHT[2] TABLES (T&D J Condensed Arrangement) — PART VI[3]

Calculated and Compiled by Geo. H. Thompson

1/16" x		1/8" x		3/16" x		1/4" x		5/16" x		3/8" x	
1"	17.73	1"	35.45	1"	53.18	1"	70.90	1"	88.63	1"	106.35
2"	35.45	2"	70.90	2"	106.35	2"	141.80	2"	177.25	2"	212.70
3"	53.18	3"	106.35	3"	159.53	3"	212.70	3"	265.88	3"	319.05
4"	70.90	4"	141.80	4"	212.70	4"	283.60	4"	354.50	4"	425.40
5"	88.63	5"	177.25	5"	265.88	5"	354.50	5"	443.13	5"	531.75
6"	106.35	6"	212.70	6"	319.05	6"	425.40	6"	531.75	6"	638 10
7"	124.08	7"	248.15	7"	372.23	7"	496.30	7"	620.38	7"	744.45
8"	141.80	8"	283.60	8"	425.40	8"	567.20	8"	709.00	8"	850.80
9"	159.53	9"	319.05	9"	478.58	9"	638.10	9"	797.63	9"	957.15
10"	177.25	10"	354.50	10"	531.75	10"	709.00	10"	886.25	10"	1063.50
11"	194.98	11"	389.95	11"	584.93	11"	779.90	11"	974.88	11"	1169.85
12"	212.70	12"	425.40	12"	638.10	12"	850.80	12"	1063.50	12"	1276.20
1/16"	1.11	1/16"	2.22	1/16"	3.32	1/16"	4.43	1/16"	5.54	1/16"	6.65
1/8"	2.22	1/8"	4.43	1/8"	6.65	1/8"	8.86	1/8"	11.08	1/8"	13.29
3/16"	3.32	3/16"	6.65	3/16"	9.97	3/16"	13.29	3/16"	16.62	3/16"	19.94
1/4"	4.43	1/4"	8.86	1/4"	13.29	1/4"	17.73	1/4"	22.16	1/4"	26.59
5/16"	5.54	5/16"	11.08	5/16"	16.62	5/16"	22.16	5/16"	27.70	5/16"	33.24
3/8"	6.65	3/8"	13.29	3/8"	19.94	3/8"	26.59	3/8"	33.24	3/8"	39.88
7/16"	7.75	7/16"	15.51	7/16"	23.26	7/16"	31.02	7/16"	38.77	7/16"	46.53
1/2"	8.86	1/2"	17.73	1/2"	26.59	1/2"	35.45	1/2"	44.31	1/2"	53.18
9/16"	9.97	9/16"	19.94	9/16"	29.92	9/16"	39.88	9/16"	49.85	9/16"	59.83
5/8"	11.08	5/8"	22.16	5/8"	33.24	5/8"	44.31	5/8"	55.39	5/8"	66.47
11/16"	12.19	11/16"	24.37	11/16"	36.56	11/16"	48.74	11/16"	60.93	11/16"	73.12
3/4"	13.29	3/4"	26.59	3/4"	39.88	3/4"	53.18	3/4"	66.47	3/4"	79.76
13/16"	14.40	13/16"	28.80	13/16"	43.20	13/16"	57.61	13/16"	72.01	13/16"	86.41
7/8"	15.51	7/8"	31.02	7/8"	46.53	7/8"	62.04	7/8"	77.55	7/8"	93.06
15/16"	16.62	15/16"	33.23	15/16"	49.85	15/16"	66.47	15/16"	83.09	15/16"	99.71

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

[3]Part I, Tool & Die Journal, May 1944
Part II, Tool & Die Journal, June 1944
Part III, Tool & Die Journal, July 1944
Part IV, Tool & Die Journal, August 1944
Part V, Tool & Die Journal, September 1944

MATERIALS[1] WEIGHT[2] TABLES (T&DJ Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	7/16" x		1/2" x		9/16" x		5/8" x		11/16" x		3/4" x
1"	124.08	1"	141.80	1"	159.53	1"	177.25	1"	194.98	1"	212.70
2"	248.15	2"	283.60	2"	319.05	2"	354.50	2"	389.95	2"	425.40
3"	372.23	3"	425.40	3"	478.58	3"	531.75	3"	584.93	3"	638.10
4"	496.30	4"	567.20	4"	638.10	4"	709.00	4"	779.90	4"	850.80
5"	620.38	5"	709.00	5"	797.63	5"	886.25	5"	974.88	5"	1063.50
6"	744.45	6"	850.80	6"	957.15	6"	1063.50	6"	1169.85	6"	1276.20
7"	868.53	7"	992.60	7"	1116.68	7"	1240.75	7"	1364.83	7"	1488.90
8"	992.60	8"	1134.40	8"	1276.20	8"	1418.00	8"	1559.80	8"	1701.60
9"	1116.68	9"	1276.20	9"	1435.73	9"	1595.25	9"	1754.78	9"	1914.30
10"	1240.75	10"	1418.00	10"	1595.25	10"	1772.50	10"	1949.75	10"	2127.00
11"	1364.83	11"	1559.80	11"	1754.78	11"	1949.75	11"	2144.73	11"	2339.70
12"	1488.90	12"	1701.60	12"	1914.30	12"	2127.00	12"	2339.70	12"	2552.40
1/16"	7.75	1/16"	8.86	1/16"	9.97	1/16"	11.08	1/16"	12.19	1/16"	13.29
1/8"	15.51	1/8"	17.73	1/8"	19.94	1/8"	22.16	1/8"	24.37	1/8"	26.59
3/16"	23.26	3/16"	26.59	3/16"	29.91	3/16"	33.24	3/16"	36.56	3/16"	39.88
1/4"	31.02	1/4"	35.45	1/4"	39.88	1/4"	44.31	1/4"	48.74	1/4"	53.18
5/16"	38.77	5/16"	44.31	5/16"	49.85	5/16"	55.39	5/16"	60.93	5/16"	66.47
3/8"	46.53	3/8"	53.18	3/8"	59.82	3/8"	66.47	3/8"	73.12	3/8"	79.76
7/16"	54.28	7/16"	62.04	7/16"	69.79	7/16"	77.55	7/16"	85.30	7/16"	93.06
1/2"	62.04	1/2"	70.90	1/2"	79.76	1/2"	88.63	1/2"	97.49	1/2"	106.35
9/16"	69.79	9/16"	79.76	9/16"	89.73	9/16"	99.70	9/16"	109.67	9/16"	119.64
5/8"	77.55	5/8"	88.63	5/8"	99.70	5/8"	110.78	5/8"	121.86	5/8"	132.94
11/16"	85.30	11/16"	97.49	11/16"	109.67	11/16"	121.86	11/16"	134.05	11/16"	146.23
3/4"	93.06	3/4"	106.35	3/4"	119.64	3/4"	132.94	3/4"	146.23	3/4"	159.53
13/16"	100.81	13/16"	115.21	13/16"	129.61	13/16"	144.02	13/16"	158.42	13/16"	172.82
7/8"	108.57	7/8"	124.08	7/8"	139.58	7/8"	155.09	7/8"	170.60	7/8"	186.11
15/16"	116.32	15/16"	132.94	15/16"	149.55	15/16"	166.17	15/16"	182.79	15/16"	199.41

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T&DJ Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	11 5/16" x		11 3/8" x		11 7/16" x		11 1/2" x		11 9/16" x		11 5/8" x	
1"	3208.23	1"	3225.95	1"	3243.68	1"	3261.40	1"	3279.13	1"	3296.85
2"	6416.45	2"	6451.90	2"	6487.35	2"	6522.80	2"	6558.25	2"	6593.70
3"	9624.68	3"	9677.85	3"	9731.03	3"	9784.20	3"	9837.38	3"	9890.55
4"	12832.90	4"	12903.80	4"	12974.70	4"	13045.60	4"	13116.50	4"	13187.40
5"	16041.10	5"	16129.80	5"	16218.40	5"	16307.00	5"	16395.60	5"	16484.30
6"	19249.40	6"	19355.70	6"	19462.10	6"	19568.40	6"	19674.80	6"	19781.10
7"	22457.60	7"	22581.70	7"	22705.70	7"	22829.80	7"	22953.90	7"	23078.00
8"	25665.80	8"	25807.60	8"	25949.40	8"	26091.20	8"	26233.00	8"	26374.80
9"	28874.00	9"	29033.60	9"	29193.10	9"	29352.60	9"	29512.10	9"	29671.70
10"	32082.30	10"	32259.50	10"	32436.80	10"	32614.00	10"	32791.30	10"	32968.50
11"	35290.50	11"	35485.50	11"	35680.40	11"	35875.40	11"	36070.40	11"	36265.40
12"	38498.70	12"	38711.40	12"	38924.10	12"	39136.80	12"	39349.50	12"	39562.20
1/16"	200.52	1/16"	201.63	1/16"	202.73	1/16"	203.84	1/16"	204.95	1/16"	206.06
1/8"	401.03	1/8"	403.24	1/8"	405.46	1/8"	407.68	1/8"	409.89	1/8"	412.11
3/16"	601.55	3/16"	604.87	3/16"	608.19	3/16"	611.51	3/16"	614.84	3/16"	618.16
1/4"	802.06	1/4"	806.49	1/4"	810.92	1/4"	815.35	1/4"	819.78	1/4"	824.21
5/16"	1002.58	5/16"	1008.11	5/16"	1013.65	5/16"	1019.19	5/16"	1024.73	5/16"	1030.27
3/8"	1203.08	3/8"	1209.73	3/8"	1216.38	3/8"	1223.03	3/8"	1229.67	3/8"	1236.32
7/16"	1403.60	7/16"	1411.35	7/16"	1419.11	7/16"	1426.86	7/16"	1434.62	7/16"	1442.37
1/2"	1604.11	1/2"	1612.98	1/2"	1621.84	1/2"	1630.70	1/2"	1639.56	1/2"	1648.43
9/16"	1804.63	9/16"	1814.60	9/16"	1824.57	9/16"	1834.54	9/16"	1844.51	9/16"	1854.48
5/8"	2005.14	5/8"	2016.22	5/8"	2027.30	5/8"	2038.38	5/8"	2049.45	5/8"	2060.53
11/16"	2205.65	11/16"	2217.84	11/16"	2230.03	11/16"	2242.21	11/16"	2254.40	11/16"	2266.58
3/4"	2406.17	3/4"	2419.46	3/4"	2432.76	3/4"	2446.05	3/4"	2459.34	3/4"	2472.64
13/16"	2606.68	13/16"	2621.08	13/16"	2635.49	13/16"	2649.89	13/16"	2664.29	13/16"	2678.69
7/8"	2807.20	7/8"	2822.71	7/8"	2838.22	7/8"	2853.73	7/8"	2869.23	7/8"	2884.74
15/16"	3007.71	15/16"	3024.33	15/16"	3040.95	15/16"	3057.56	15/16"	3074.18	15/16"	3090.80

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T&DJ Condensed Arrangement)

MATERIALS[1] WEIGHT[2] TABLES (T&DJ Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

11 1/16" x		11 3/4" x		11 13/16" x		11 7/8" x		11 15/16" x		12" x	
1"	3314.58	1"	3332.30	1"	3350.03	1"	3367.75	1"	3385.48	1"	3403.20
2"	6629.15	2"	6664.60	2"	6700.05	2"	6735.50	2"	6770.95	2"	6806.40
3"	9943.73	3"	9996.90	3"	10050.10	3"	10103.30	3"	10156.40	3"	10209.60
4"	13258.30	4"	13329.20	4"	13400.10	4"	13471.00	4"	13541.90	4"	13612.80
5"	16572.90	5"	16661.50	5"	16750.10	5"	16838.80	5"	16927.40	5"	17016.00
6"	19887.50	6"	19993.80	6"	20100.20	6"	20206.50	6"	20312.90	6"	20419.20
7"	23202.00	7"	23326.10	7"	23450.20	7"	23574.30	7"	23698.30	7"	23822.40
8"	26516.60	8"	26658.40	8"	26800.20	8"	26942.00	8"	27083.80	8"	27225.60
9"	29831.20	9"	29990.70	9"	30150.20	9"	30309.80	9"	30469.30	9"	30628.80
10"	33145.80	10"	33323.00	10"	33500.30	10"	33677.50	10"	33854.80	10"	34032.00
11"	36460.30	11"	36655.30	11"	36850.30	11"	37045.30	11"	37240.20	11"	37435.20
12"	39774.90	12"	39987.60	12"	40200.30	12"	40413.00	12"	40625.70	12"	40838.40
1/16"	207.17	1/16"	208.27	1/16"	209.38	1/16"	210.49	1/16"	211.60	1/16"	212.70
1/8"	414.32	1/8"	416.54	1/8"	418.75	1/8"	420.97	1/8"	423.18	1/8"	425.40
3/16"	621.49	3/16"	624.81	3/16"	628.13	3/16"	631.45	3/16"	634.78	3/16"	638.10
1/4"	828.64	1/4"	833.08	1/4"	837.51	1/4"	841.94	1/4"	846.37	1/4"	850.80
5/16"	1035.81	5/16"	1041.34	5/16"	1046.88	5/16"	1052.42	5/16"	1057.96	5/16"	1063.50
3/8"	1242.97	3/8"	1249.61	3/8"	1256.26	3/8"	1262.91	3/8"	1269.55	3/8"	1276.20
7/16"	1450.13	7/16"	1457.88	7/16"	1465.64	7/16"	1473.39	7/16"	1481.15	7/16"	1488.90
1/2"	1657.29	1/2"	1666.15	1/2"	1675.01	1/2"	1683.88	1/2"	1692.74	1/2"	1701.60
9/16"	1864.45	9/16"	1874.42	9/16"	1884.39	9/16"	1894.36	9/16"	1904.33	9/16"	1914.30
5/8"	2071.61	5/8"	2082.69	5/8"	2093.77	5/8"	2104.84	5/8"	2115.92	5/8"	2127.00
11/16"	2278.77	11/16"	2290.96	11/16"	2303.14	11/16"	2315.33	11/16"	2327.51	11/16"	2339.70
3/4"	2485.93	3/4"	2499.23	3/4"	2512.52	3/4"	2525.81	3/4"	2539.11	3/4"	2552.40
13/16"	2693.09	13/16"	2707.49	13/16"	2721.90	13/16"	2736.30	13/16"	2750.70	13/16"	2765.10
7/8"	2900.25	7/8"	2915.76	7/8"	2931.27	7/8"	2946.78	7/8"	2962.29	7/8"	2977.80
15/16"	3107.41	15/16"	3124.03	15/16"	3140.65	15/16"	3157.27	15/16"	3173.88	15/16"	3190.50

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

GEORGE J. HUEBNER HONORED BY CHICAGO TOOL & DIE INSTITUTE

by Paul Campbell

Presentation of an Honorary Award of Merit to George J. Huebner, editor and publisher of the TOOL & DIE JOURNAL, was one of the highlights of a meeting of Middle West Industry members held under the auspices of the Tool & Die Institute of Chicago, on September 8.

The award in the form of an illuminated plaque was presented to Mr. Huebner "in recognition of his long and earnest efforts in behalf of the Tool & Die Institute . . . a tribute to the character and excellence of his work."

Prior to the presentation, Institute President Chas. S. Bohmer introduced Mr. Huebner, called attention to his more than two years of loyal and helpful service as Tool & Die Consultant on the staff of the War Production Board at Washington, and praised his intelligent and sympathetic understanding of the tooling industries. The actual presentation of the plaque was made by Herman Siemund, one of the Chicago Industry's old-timers.

Cooperation—or "intelligent selfishness"—among Industry members was emphasized by R. F. Moore of Bridgeport, Conn., First Vice President of the National Tool & Die Manufacturers Association (since elected President). One encouraging move that will help the Industry, he said, is the trend toward specialization.

"Twenty years ago we accepted everything and so did our competitors—dies, molds, gages, fixtures, special machinery—but we found that this just didn't 'pay off.' Today you find shops specializing on molds, shops specializing on lamination dies, shops specializing on gages. I don't have to explain to you men the advantages of this trend."

Charles Bohmer, President of the Chicago Tool & Die Institute, discussed the Institute's activities, pointing out that the past 20 years' experience of the Chicago group has definitely proved its value. President Bohmer emphasized that the by-laws have been broadened to include not only business relations among the members but also many common intra-industry problems involved in production, distribution, employment, and financial functions of the Industry.

George J. Huebner

In recognition of his service to the Industry, a plaque was also presented to L. A. Sommer of Cleveland, who in September completed his term as the first President of the National Tool & Die Manufacturers Association. Mr. Sommer was prevented by illness from attending, but his address was read at the meeting.

Stressing the value of a united ap-

proach to the industry's problems, Mr. Sommer wrote: "Trade associations have played an important part in the war effort and the need for them is probably more widely recognized today than ever before. As we approach the postwar transition, the need for a strong Trade Association in this Industry becomes greater than ever."

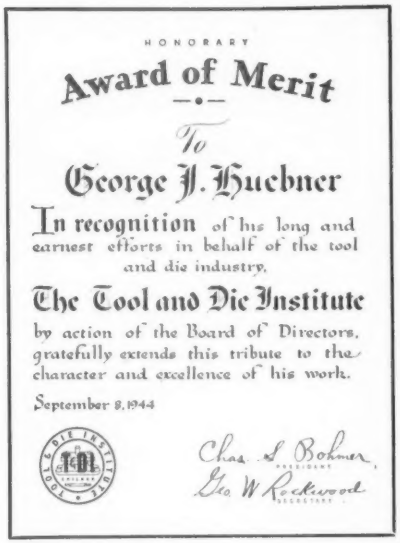
In his address, Mr. Huebner emphasized the value of Industry organization and cooperation. He suggested that the Tool & Die Industry is in need of two types of organization: (1) the local, to handle the problems of the area group; (2) the national trade association, to coordinate and supplement the efforts of the local groups and build them into a strong cohesive organization truly representative of the Industry and capable of dealing with other industries, and with government.

"Today," he said, "every industry worthy of the name maintains its national organization. There are thousands of them and the Tool & Die Industry should take its place among them with a strong, well managed national Association. It is well to remember that when members of an industry speak through a strong national organization, their voice is powerful; when an individual member speaks only for himself his voice is comparatively weak and his motive frequently impugned as selfish.

"Properly developed, Industry organization spells cooperation—all for one and one for all. Almost everything can be better done through cooperation. This is particularly significant when one stops to realize that no man knows just how events will shape up during the reconversion period."

He said it was a fact that before this war few men outside of the manufacturing industries could define a machine tool, but that every man, woman and child has had the opportunity to learn from our daily newspapers that a machine tool is the master tool of industry and that our precision parts production is made possible only by tools and dies which hold tolerances to ten-thousandths of an inch and gages which measure them.

"Among the industries responsible for our miraculous war production, none has had a more important part, none has greater accomplishment to its credit than your own Tool & Die Industry. Others have received more publicity, perhaps even more credit, but you have the satisfaction of knowing—and I speak now from experience as a War Production Board staff member—that thousands of precision parts ranging from those for rifles and machine guns and their ammunition to those for flying fortresses—their engines, bomb sights and radar equipment could never have been made without your precision tooling."


HONORARY

Award of Merit

To

George J. Huebner

In recognition of his long and earnest efforts in behalf of the tool and die industry,

The Tool and Die Institute

by action of the Board of Directors, gratefully extends this tribute to the character and excellence of his work.

September 8, 1944

Chas. L. Bohmer, President

Geo. W. Rockwood, Secretary

Pointing out the opportunities that will exist for designing and building many of the tools which will be required for civilian production, Mr. Huebner had this to say of the outlook for the future:

"I firmly believe that we are now standing upon the threshold of a great day. Upon each of us rests the solemn obligation to conduct his business with great wisdom. We are in a new era of human relations and many are looking forward fearfully to a period of disagreement and contention. For myself I have decided that the fulfillment of good intentions builds strength, be it business, industry, or government. In my own business, therefore, I expect to operate on the basis of the greatest good to the greatest number. For me it is a satisfying formula."

A Plastic Tooling Story

GOLD PLATING OF MOLDS SPEEDS ASSEMBLY PRODUCTION OF JIGS AND FIXTURES

by C. R. Simmons
Durez Plastics & Chemicals, Inc.
N. Tonawanda, N. Y.

A new plastic tooling development in which gold plating of steel molds has greatly accelerated the production of cast resin assembly jigs and fixtures has been announced by engineers of the Eastman Kodak Company. A Durez liquid casting resin was employed and the process was developed to meet stringent time requirements set by a government at war.

Under traditional methods of tool and fixture production it would have been necessary to convert tons of steel into usable tools at the expense of thousands of skilled man-hours. The time involved would have been too great to meet the government needs. Therefore, it was decided to employ a liquid phenolic casting resin. But even with this, a problem presented itself. A steel mold was considered necessary if a great many castings were to be made and a tolerance of .001" was to be held. A steel mold was used for making the plastic part of casting resin because it afforded greater accuracy and stability than any other type of mold (such as wood, plaster, or latex).

Where one or even a few castings had to be made, little consideration was given to the protective coating and parting agent applied to the working surface of the mold; but since an acid accelerator was employed to speed the curing process of the resin, some medium had to be employed to protect the mold from an unfavorable reaction with this acid. Ordinarily, for a few castings, an organic medium, such as Tygon paint, would be used for this purpose. However, after each casting it was necessary to disassemble the mold, clean off the organic residue, and recoat carefully so that tolerances on the next casting would be maintained. For these reasons another protective medium was sought.

Within a week Eastman engineers found an answer to their problem by plating the working surfaces of the mold with gold, a metal resistant to all acids except aquaregia. Covered with a thin coating of liquid wax, the gold proved to be an ideal protective coating and parting agent. Fixtures could be produced in three hours instead of the original twenty hours which were required when using an organic coating.

The protective coating of gold plate permits the utilization of the accuracy and stability properties of steel molds and simultaneously permits castings at a lower cost per unit. Multiple castings may be made from gold plated molds without the cost and time lag of repreparing the mold for each new casting. As soon as one casting is removed from the mold, another may be immediately poured and cured. In molds where the resin is poured about a plug or core, it is advisable to wipe a wax as a lubricant on these parts. This is to keep the gold from wearing when the castings are removed from these parts.

The gold plating of the mold follows a preliminary copper plate and a nickel plate. The thickness of the plating was controlled so that it did not interfere with the desired dimensions of the completed cured castings. The plating operations are as follows: copper plate, .0003"; nickel plate, .0001"; gold plate (Wittenberg Process), .0001" (max.). A better plating was secured by disassembling and plating the mold in individual parts. Surfaces which did

(TO PAGE 232—PLEASE)

Procedures in Plastics

DESIGN OF MOLDED PLASTICS PARTS

CONTOUR DESIGN - PART 2

By Warren V. Prince

Thickness of Wall Sections

Many factors influence the thickness of wall sections including:

(1) Length of molding cycle or curing time
(2) Uneven cure in thermosetting materials
(3) Warpage of parts during cooling and after molding
(4) Gas pockets in molded pieces
(5) Ease with which cavity is filled
(6) Shrink marks
(7) Dielectric strength for electrical applications

Generally speaking, it is advisable to keep the wall sections of a plastics part as thin as the required strength of the part will permit. Thin sections allow much shorter molding time in production; often minimize forming or trapping of gases during molding; reduce shrink marks; and save material.

On the other hand, too thin a section will allow warpage of the part, either upon being ejected from the mold while it is still hot and in the semi-soft condition, or will allow warpage during cooling of the part from mold temperature to room temperature, due to uneven cooling or uneven shrinkage. Thermoplastic materials in particular will often warp in service, long after molding, due to evaporation of plasticizers, moisture absorption, temperature changes, occasionally from continued polymerization, and from cold flow due to applied pressure if the wall sections are too thin.

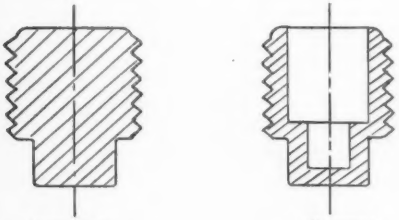
The most serious effect of a thick wall section is the long time that is required to cure the piece if it is made from a thermosetting material, and the long time required to cool the piece to harden it in the mold if it is a thermoplastic material. Both require time. Plastics materials are exceedingly poor conductors of heat. For that reason they require a rather definite length of time in changing the temperature by conduction from the mold cavity walls to the innermost parts of the material. Remember that plastics conduct heat slowly.

Thermosetting materials require more time for curing than thermoplastic materials require for hardening by cooling. This is true because the thermosetting materials must not only come up to the temperature of the mold but they must take time to polymerize or chemically change into another substance as the result of prolonged heat. Most thermoplastic materials merely have to change temperature in order to harden properly.

Curing Time

For example, the time required for a good cure of a thermosetting material

of ⅛-inch thick wall section is about one minute. If the wall section were one inch thick, it would require at least half an hour and would have an uneven cure at best. A part molded of thermoplastic material and having a ⅛-inch wall section would require approximately twenty to thirty seconds to harden from cooling, whereas a one inch thick wall section would require several minutes.



Incorrect Correct

Fig. 7—The solid section would take too long to cure and the threads would very likely shrink unevenly; the cored section would cure faster and would shrink less.

Thus, we see the importance of wall thickness from the standpoint of production time, especially with thermosetting materials.

Fortunately, however, there is a very effective method of speeding up the molding time required for thick wall sections in thermosetting materials. This method utilizes high frequency heating or dielectric heating* for bringing up the temperature of tableted material or preforms to the molding temperature within twenty seconds to eighty seconds *before* the material is put into the mold. This method insures that the material charge is heated uniformly throughout its mass when placed into the mold. Cure hardening time is then comparatively short.

For example, a one inch thick section would harden and become thoroughly cured throughout in about one and one-half minutes instead of thirty minutes. High frequency heating is not practical with thermoplastic materials because they cannot be readily preformed into tablet form prior to compression molding; for injection molding the heating cylinder is more practical for heating thermoplastics than with high frequency.

*See article on "Dielectric Heating", this issue.

Curing Time Regulated by Thickest Section

When thin and thick sections occur on the same piece, the curing time must be regulated for the thickest section. With thermosetting materials the cure will be very uneven throughout the thick section. The thin sections will become thoroughly heated throughout long before the thick sections will begin to cure at the center. Hence, the thin sections will *overcure* and lose some of their physical properties while the thick sections will be overcured on the outside and *undercured* in the middle.

Incorrect Correct

Fig. 8—The thin sections of the part at the left would overcure while the thick section would undercure. Warpage and shrinkage marks would appear on the bottom surface. The same part of one thickness would not warp and the bottom sections would cure flat.

There are four remedies for minimizing troubles due to uneven cure:

(1) Lower the temperature and increase the curing time to get a more even cure throughout
(2) Preheat the material charges prior to molding to save heating time in mold
(3) Select a material with a slower curing rate (consult your material manufacturer's representative)
(4) Use high frequency heating to bring the entire material to molding temperature throughout before placing it in the mold.

Of these, the high frequency heating is by far the most effective where thick sections are involved.

An example of preheating follows:

For general purpose phenolics, place the powdered material on a tray in an oven heated to 180° F and heat for a period of approximately twenty minutes. For the same material but in tablet form, use 110° F for thirty to forty minutes. This drives out moisture as well as accomplishing preheating.

Warping

Warping is a common result in plastic parts of uneven wall sections, whether

the material be thermosetting or thermoplastic. A thick section, being of greater dimensions, will shrink more than a thin section and will distort the piece to some extent upon cooling. Similarly, the thick sections will lose their heat more slowly

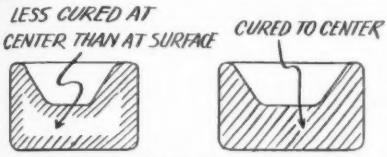


Fig. 9—These pieces are similar except for curing. The left piece was cured by conventional molding methods; the right piece was cured after preheating by high frequency prior to molding.

after molding than the thin sections, thus causing the thin sections to shrink and harden first before the thick sections can harden throughout.

Thin sections tend to shrink and pull themselves out of relationship with the thick sections. Later when the thick sections cool and shrink they pull upon the thin sections, but the thin sections will not move because they have already hardened. Hence, permanent strains are set up in the piece and warpage results. Sometimes these strains are so prominent in hard materials that a slight jar or clamping force will break the piece.

Gas Pockets

Gas pockets are another occurrence to be expected with thick and thin sections in the same piece. The gas pockets develop in the center of the thickest portions. Gases develop during molding as a byproduct of polymerization, or as a result of moisture absorption in the material prior to molding. In normal molding, these gases tend to work their way out of the material due to the molding pressures, and pass on out of the cavity. With a thick section, however, the outside cures or hardens first before the inside has fully completed its polymerization. The outside becomes so hard that the internal gases developed cannot escape and are thus trapped, causing a gas pocket.

This trouble can usually be remedied by slowing down the curing rate with less heat and more time during molding; preheating the materials prior to molding to drive out absorbed moisture and to add heat so that center portions of thick sections have some heat at the beginning of the molding cycle; selecting a slower setting material; or, by using high frequency heating, to make the curing rate the same throughout the thick section.

Thin wall sections designed on a plastics part require correspondingly thin passages in the mold. Such thin passages become very difficult to fill with plastic material during molding, due to stiffening, and will become impossible to fill if the section is too thin for too great a distance.

The possibility that a given material will harden and stop flowing while trying to get through thin or narrow passages in the mold cavity must be carefully considered. If the passage is too thin, the material will go part way and stop, due to thickening or setting. This will happen unless the thin section is already filled with material before the mold is closed. For example, a thin section can

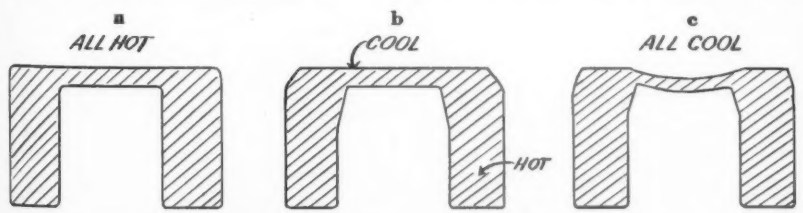


Fig. 10—Warping due to shrinkage caused by uneven wall thickness. The all hot piece "a" as it comes from the mold; in "b" the thin section has cooled while the thick section is still hot (note the abrupt shrinkage of the upper shoulder as the thin section draws upon the softer thick sections); in "c" the thick sections have cooled to approximately the same dimensions as the thin section. The contraction from the cooling has forced the thin section to bulge (inward or outward).

readily be made at the bottom of the cavity on a compression mold because the material is already on the bottom prior to closing.

If the material must flow through a thin passage, the distance of flow must be short. The thicker the passage, the wider can be the distance to travel. Try to analyze the direction of flow. Sometimes flow occurs in one portion before another where it normally might be expected to occur. Temperatures, pressures, thicknesses, and distances all govern flow of material in a mold.

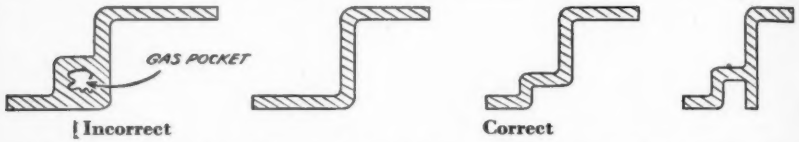


Fig. 11 — A faulty design (left) results in the formation of a gas pocket. When alternate designs with uniform wall thickness can be employed this trouble can be avoided.

Thermosetting materials absorb heat as they move through the thin passages, polymerize, and harden very rapidly. A space of .002 or .003 thickness will stop flow almost instantly unless the pressure is excessive. With thermoplastic materials the mold absorbs heat from the material flowing through it since the materials, being previously heated, are injected into a mold which is comparatively cooler. During injection, the material fills the cavities so rapidly that it does not get a chance to cool until the cavity is filled.

Injection molding of thermoplastic material such as cellulose acetate becomes quite difficult in filling the cavity if a section is over one inch in length and has a thickness of less than .050 inch or $\frac{1}{32}$ inch.

Thick sections in thermoplastics are much quicker to mold than thick sections of thermosetting materials. For example, a one inch section of thermoplastic material can harden sufficiently to be able to remove it from the mold within about four minutes. Only the outside, however, will be hardened while the center remains soft upon removal. The outside is hardened enough to hold the soft putty-like center intact until further cooling from the air gradually hardens the center. In this case a long hardening time is not necessary as it would be for thermosetting materials because the material is homogeneous throughout when the piece finally becomes hardened. In thermoplastic materials the rate of hardening has no effect except shrinkage.

The one serious drawback to the molding of thick-section thermoplastics is that shrink marks or sink marks become very predominant. Actually it is impractical to attempt to mold a one inch thick section in thermoplastics. Anything above $\frac{1}{8}$ to $\frac{1}{8}$ is dangerous on account of sink marks on the surfaces and uneven shrinkage and warpage.

Shrink Marks

Uneven cooling of a molded piece causes uneven shrinking. Surface depressions caused by such shrinking are called shrink marks. If the cooler portions of a molded piece are held to the surface in any way, such as by threads or shoulders, so that they cannot shrink along the surface because of irregularities in contour, these portions will take up their shrinkage perpendicular to the surface and draw upon the hotter and softer material at the center.

Under such conditions shrinkage will occur predominantly in one spot and at a place where the mold contour will permit shrinkage away from the surface and toward the center of material having the accelerated shrinkage.

This explains why thermoplastic parts often show sink marks so much more predominantly than the same part when molded of thermosetting materials. Thermosetting materials do not have their temperature reduced while in the mold. They are removed from the cavity at their highest temperature and cool or shrink while in the air.

Do not confuse this with "mold shrinkage". Mold shrinkage is shrinkage away from the mold dimension and is compensated for by the designer. Shrink marks

This side, held by threads and shoulder, cannot shrink lengthwise; it shrinks radially, drawing upon the center section.

This side shrinks lengthwise along the core; the compensation for the outer shrinkage, indicated by arrows, causes the shrink mark.

Fig. 12—A temperature drop in a material still in its mold, common in thermoplastics, often causes shrink marks.

are the result of one part being held from shrinking while another part is allowed to shrink. Shrink marks occur in thermosetting materials when one portion hardens from curing while another part is still soft and can move to compensate for shrinkage.

Thickness for Dielectrics

All plastics resins are good dielectric materials and many are used solely for their electrical insulating characteristics. The wall thickness governs the voltage resistance of the part in question.

To arrive at the thickness required for a certain voltage, use the physical properties chart or data sheet for material and the dielectric strength will be given in terms of volts per mil. One mil is .001 inch. For example, if a material must withstand 3000 volts and has a rated dielectric strength of 300 volts per mil, the minimum thickness required would be 3000/300, 10 mils or .010 inch.

This method of figuring is not quite an exact function of the thickness but is close enough for practical purposes. A margin of safety should be allowed in this case as with all calculations. Never design a wall section to the limit of its capactiy.

Bear in mind that an electric arc will pass through air much easier than through plastics. Consequently, if the wall section does not extend far enough, the arc may pass around the plastic through the air. The same is true if conductors such as metal are located too close to one another.

The best materials for electrical purposes can be determined from the plastics properties chart. For best results all plastics materials for electrical purposes should be preheated prior to molding to drive out any moisture that may have been absorbed in the material from the atmosphere. Moisture present in a material lowers its electrical properties below the stated values.

Never permit an arc to occur along the surface of a plastic or carbon tracking will result. Carbon tracking is the instantaneous burning and charring of the plastic on its surface as a result of the heat generated by the arc. Plastics materials, being organic compounds, contain carbon, hydrogen, and oxygen. The heat consumes the hydrogen and oxygen and leaves nothing behind but carbon which, when existing alone is a conductor of electricity rather than an insulator. When a plastics material has once carbon-tracked it no longer is an insulator but becomes a conductor along the carbon track. Wall thickness, however, has no relation to carbon tracking unless the section is so thin that it tends to allow penetration of the voltage.

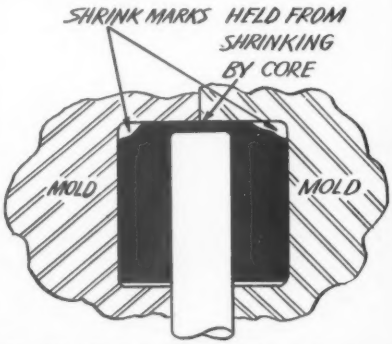


Fig. 13—Shrink marks such as these are caused by the relative freedom of some parts to shrink normally.

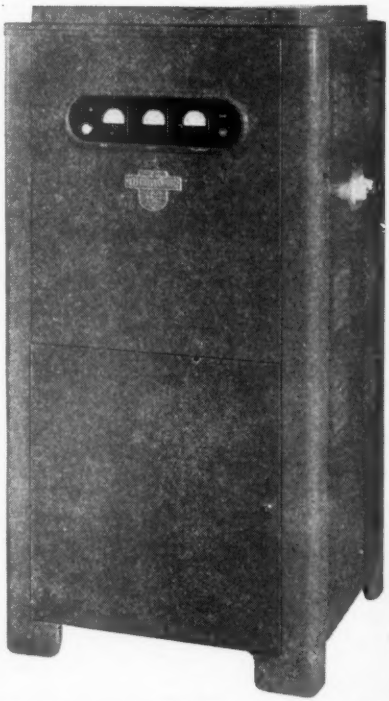
DIELECTRIC HEATING

By J. Wesley Cable
Director of Research & Development
INDUCTION HEATING CORPORATION

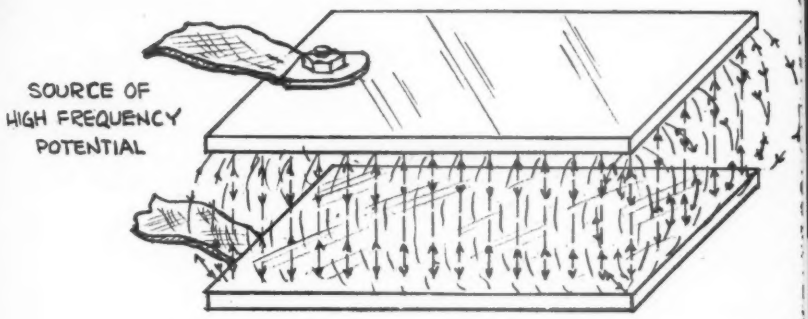
The introduction of electronics to industry has brought about many outstanding improvements in production and quality during the past few years, and predominant among these achievements are those whose effectiveness depend on the use of "electronic heat". While this term should not be used in reference to the basic phenomena involved, it has come to mean those methods which employ electronic tubes and circuits in the transformation of electrical energy to heat. A very large percentage of the capacity of such electronic heating equipment installed thus far has been for high-frequency induction heating, and production engineers throughout the world have come to consider the high-frequency induction heating unit as common and usable a machine tool as a lathe or drill-press, and have set up their production lines accordingly. The ease with which the high-frequency magnetic field can be controlled and, in turn, the heat pattern, has resulted in the mass production of brazed and selectively hardened metal parts which were formerly considered out of the question.

Engineering research has now developed a newer form of electronic heat which is adaptable to non-metallic material. This is known as "dielectric heating". Its unique manner of application makes it as great a boon to the non-metallic field as induction heating has been to the metal industries, and since the two methods are somewhat analogous, a brief review of induction heating, already known to many, is in order.

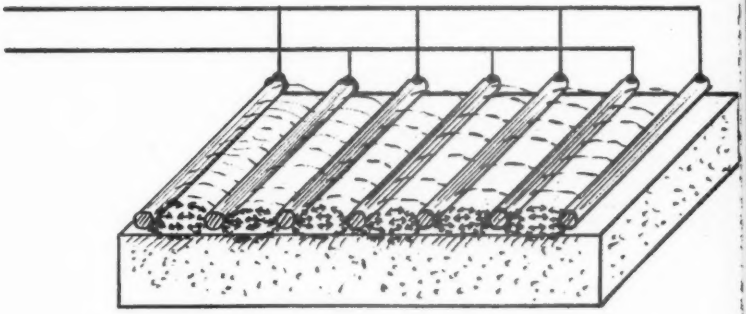
As previously pointed out, high-frequency induction heating is the transfer of energy from an alternating magnetic field to a particular piece of metal, or section of that piece. This metal may be ferrous or non-ferrous, and the heating takes place as a result of secondary eddy curents being forced to circulate



The Thermonic dielectric generator. This unit is rated at 200 Btu's per minute output or approximately 3½ kw. Frequency-15 to 28 megacycles; efficiency 50 per cent (overall).



DISTRIBUTION OF DIELECTRIC FIELD BETWEEN FLAT ELECTRODES



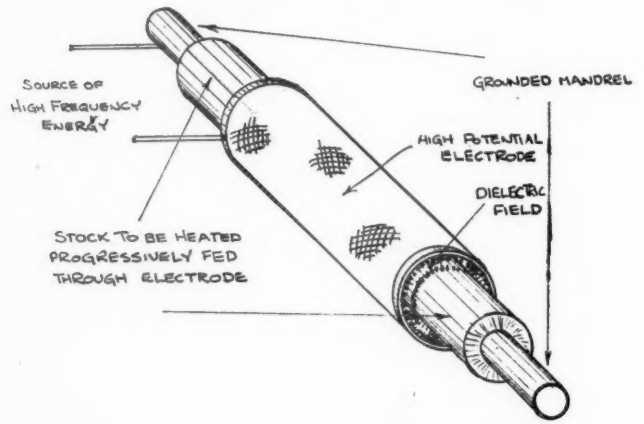
DISTRIBUTION OF DIELECTRIC FIELD BETWEEN FINGER TYPE ELECTRODES

on the surface of the metal itself when it is surrounded by a high-frequency current-carrying conductor. These eddy currents are of much greater magnitude in magnetic material due to the higher permeability of the material and greater resultant magnetic flux; not to the presence of hysteresis losses in magnetic material as is popularly believed. Although magnetic hysteresis losses are present in all magnetic material in a state of high-frequency magnetic excitation, they are negligible in comparison to the eddy current losses, and should not be considered in the analysis of an induction heating problem. It should not be construed however, that non-magnetic materials cannot be heated by induction because, even though they are more difficult to heat as a result of the lower flux densities and lower specific electrical resistance, these deficiencies can be compensated for by raising ampere-turns of the coil.

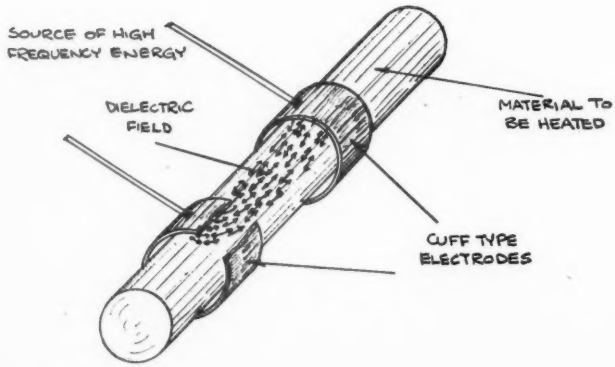
The heat energy in induction heating is a function of the square of the current flowing in the heating coil, a variable power of the frequency of the current, and the resistivity of the material being heated. The usual form of heating coil consists of a helix of one or more turns of copper conductor surrounding the metal to be heated in such a way that the magnetic lines of force produced by the coil interlink with it. The voltage across the terminals of the coil has to be suffi-

cient to cause the proper current to flow through the impedance of the coil, and since this value is a function of the frequency, the terminal voltage will be greater for higher frequency work. This is brought out to establish the fact that the important quantities in induction heating are (1) coil current, (2) frequency, and (3) electrical resistivity and permeability. The heating action is comparable to a transformer where the work becomes the secondary and currents are caused to circulate on its surface. The material being heated must be a nominally good electrical conductor.

Dielectric heating requires that the material be a nominally poor electrical conductor, and its principles are founded


SOURCE OF HIGH FREQUENCY ENERGY
GROUNDED MANDREL
HIGH POTENTIAL ELECTRODE
DIELECTRIC FIELD
STOCK TO BE HEATED PROGRESSIVELY FED THROUGH ELECTRODE

SKETCH SHOWING CYLINDRICAL ELECTRODES



SKETCH SHOWING CUFF-TYPE ELECTRODES

on this basic theory. As with induction heating, the fundamental process was first looked upon as a hindrance in the attainment of high efficiency in electrical apparatus, and shows up as core loss in alternating current motors and transformers, which is pure and simple induction heating, and as dielectric loss in capacitors and high-voltage cable, these being dielectric heating in its elemental state. It is an established fact that as a magnetic field surrounds an alternating current-carrying conductor, an electric field is present between electrodes of opposite alternating current potential. Also, any material, whether it be air, liquid, or solid, that is placed between these electrodes will absorb energy from this field. This phenomenon should not be confused with pure resistance loss which also takes place under like conditions, but should be looked upon as an actual distortion of the electron path within the molecules of the material itself. According to popular conception of atomic theory, each atom is made up of a positively-charged nucleus surrounded by planetary electrons rotating each in its orbital path. Any change in electron velocity, or distortion of this orbit, is accompanied by an energy transfer, which is the basis of operation of the famous "cyclotron" for the transmutation of metals. A parallel can be drawn in the operation of dielectric heating equipment, and the attracting and repelling forces of the oppositely charged electrodes can be considered as acting directly upon the electrons of the atoms going to make up molecules of the material being heated. These individual molecules undergo a heating effect and in turn uniformly bring about a temperature rise in the mass. This theory of individual molecule action also lends itself to the explanation of some effects not noticed when the same material is heated by conventional means. This point will be expanded later. A practical concept of this molecular action is the heating of a sponge rubber ball by continued squeezing and releasing, or the heating of an automobile tire when it is run underinflated, and so continually flexes the side walls of the tire.

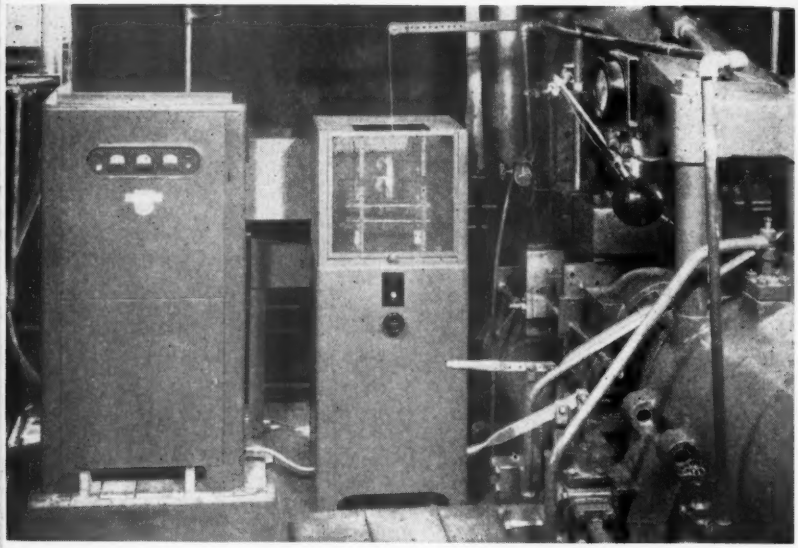
Let us now investigate the fundamentals involved in heating by means of a high-frequency dielectric field. The heat energy liberated in a unit mass of nominally non-conducting material in an alternating electric field is a function of the square of the voltage impressed on the material, the first power of the frequency of the electrical source, the power factor of the material at the particular frequency, and the dielectric constant of the material. These two latter quantities are often expressed as a loss factor which is obtained by multiplying them together. When the unit mass described above becomes a section of fixed dimensions, then the power is given by the following formula:

$$\text{POWER} = 1.41\ E^2\ f\ F_1 \frac{A}{t} \times 10^{-12} \text{ watts}$$

where: E is the voltage impressed on the material
f is the frequency in cycles per second
F_1 is the loss factor (power factor x dielectric constant)
A is the area of the material between the electrodes in sq. in.
t is the thickness of the material in inches.

The power, determined from the above formula, multiplied by the time of application gives the energy released within the mass, and this quantity, expressed in a unit such as watt-seconds, can be converted directly into Btu's. By obtaining the number of Btu's necessary to raise the temperature of a specific material to a given value by multiplying its mass, by its specific heat, by the temperature rise, the power required in the generator equipment can be determined.

By looking into the above formula, it can be seen that the most important value in the equation is the voltage since the loss varies as its square. However, this voltage must be limited to such a value as to prevent flash-over, which would be damaging to the material being heated. The next variable in the equation is frequency, and it can be seen that this should be as high as is feasible in practice, running from one million cycles per second to as high as one hundred or more millions of cycles per second. This is one of the principal differences between dielectric and induction heating generators, the latter type usually operating at frequency of the order of 300 to 500 kilocycles. Since all the other terms of the equation are constant of the material itself, no control can be maintained except where the addition



The Thermonic high frequency dielectric generator and electrode cabinet are shown in relation to the molding press. A separate electrode cabinet permits operation of more than one set of electrodes from a single generator by use of selector switches.

some substance, such as water, will change the loss factor of the material without affecting the quality of the finished product.

Flat Electrodes

The dielectric field is usually produced by flat electrodes and the material to be heated is placed between them. The field can then be represented by a series of lines perpendicular to the electrode plates, with some fringing effect at the edges. This type of electrode is the simplest to use, and the contour of the plates can be profiled so as to heat the work uniformly. Or should a non-uniform heat pattern be desired, shaping of the plates will tend to accomplish such an effect. Up until now, it has been assumed that the plate electrodes have been in direct contact with the material, but this last point indicates that heating can be obtained with air spacing between the electrodes and work. If this case is analyzed, it will be seen that the dielectric under such spaced conditions simply appears as two dielectrics, one being air, in series. Hence there is a voltage division between the two layers inversely as the dielectric constants, much as the voltage in conventional electrical circuits divides across two series resistors inversely as their resistance. It should be remembered, however, that under such conditions the voltage drop across the air-gap is not utilized in output, and so full output of the generating unit cannot always be forced into the work. Many times it is found expedient to allow an air-gap across the entire electrode face, especially where there is non-uniformity of thickness of the material being heated, and the high spots would tend to cause flash-over if the electrodes were directly in contact with it.

Finger Electrodes

Electrodes can be in many forms beside the flat plates, and as is the case of the many coil designs used for optimum results in induction heating, different electrode set-ups find use in dielectric heating applications. One type which lends itself very readily to certain types of heating is the finger electrode. Here the field is produced between alternate fingers and it can be readily seen that the

material tends to heat at the surface; a fact which is opposite to the usual conception of dielectric heating and which will be brought out when the utilization of this type of heating is covered. Electrodes forming concentric cylinders are also used to advantage where tubular form of material is desired to be heated, with the added feature that the material can be fed continuously through the set-up. Cuff-type electrodes localize the field in such a manner as to effectively heat cylindrical shapes. The extreme advantages obtained by the different shape electrodes will be best emphasized by actual examples of their use.

Dielectric and Induction Heating

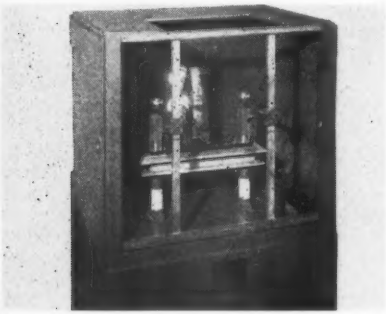
Let us now review for a moment the analogies between dielectric heating and induction heating. The loss in dielectric work varies as the square of the voltage applied to the electrodes, while the loss in induction heating varies as the square of the current circulating through the coil. Hence, dielectric is a voltage phenomenon while induction is a current function. The heat produced by dielectric heating varies as the first power of the frequency of the potential applied to the electrodes, while in induction work the heat is a function of the square of the frequency at lower values, dropping off to somewhere near the square root of the frequency at higher values. And last, the heat produced in dielectric heating is a function of the loss factor of the material, obtained by multiplying the power factor by the dielectric constant, while induction heat depends on the resistivity and permeability of the metal being heated. These are the values which should always come to mind when either induction or dielectric heating are being investigated. If the material for dielectric heating has a low loss factor, the frequency must be raised and the voltage increased to compensate for it. If the material is thin, and thereby susceptible to flash-over, the frequency must be increased and the voltage kept below the flash-over value.

In order that any new method be adopted, it must necessarily provide something that cannot be attained by other means, or it must do it in such a manner that resultant economies warrant the purchase of the equipment and its installation. Dielectric heating has shown its ability to do these things in many instances, and thinking has been stimulated to provide many other applications in the future. To repeat, dielectric heating is fundamentally a process of heating material which is nominally non-conducting from an electrical standpoint. The physics of materials somehow seems to tie together the electrical and thermal conductivity of substances. In other words, if a material is a good electrical conductor, it is a good thermal conductor, and vice versa. The heating of materials that are poor thermal conductors has always been a difficult problem when handled by conventional means, since there is inherently a large temperature gradient from the surface of the mass to the inner portions, and heating rates in Btu's per minute per unit surface area many times are limited by this temperature differential. This of course, is not universal, for without this effect there would be no crust on bread nor would there be such a thing as a juicy charcoal broiled steak, crisp on the outside but rare and juicy in the center of the meat. However, to uniformly dehydrate a large bale of tobacco is made practically impossible by the same reasoning when the heat for evaporating the moisture must be conducted into the mass from a drying kiln. The prime attribute of dielectric heating is its ability to generate equal amounts of heat in every section of a mass of material regardless of whether this section is at the surface or at the center. This is extremely important in operations for drying, heating for physical changes, as in the polymerization of thermosetting plastics and other organic materials, and in the uniform heating of material for sterilization. The mass of material that can be heated, and the production rates involved, dictate the electrical capacity of the unit necessary. It is here that economics comes into the picture, and a cost study must be made to determine whether or not the process is feasible from a money standpoint. But the radical element in the method of heating and the heretofore unobtainable products that result, go a long way in proving large expenditures for equipment as sound investments.

Heat Flow from Center to Surface

Since each unit mass of the material receives the same number of Btu's every second, it can be seen that the whole

philosophy of heating must be reversed to accommodate these new ideas. Instead of having a higher temperature at the surface, as is the case with conventional heating, the radiation and conduction of heat energy from the surface of dielectrically heated objects results in a higher temperature at their centers with an overall heat flow from the center to the surface. The degree to which this effect manifests itself, of course, depends upon the rate of heat



The electrode set-up for preheating rag filled phenolic resin preforms for transfer molding. The preform, 1¼" x 10" x ½", weighing 7 ounces, can be seen between the electrodes. Heating time 45 seconds.

input to each unit mass, and under high values for the heating of wood, a definite charring has occurred at the center of a one-half inch thick piece of plywood with the outer surface untouched. This obviously is an extreme condition, and only illustrates the point. In practice it is not unusual to enclose the electrode set-up in a small oven held at the final temperature to eliminate this radiation effect. This inside heating is also disastrous in cases where water is to be evaporated, since the center section can quickly reach the point where the water flashes into steam with a disrupting force which damages the outer section.

And now for some actual examples of dielectric heating which have proven its value to industry, and the formation of the axiom that every process that requires the heating of non-conduction material is a potential user of dielectric heating. Probably the most publicized use has been in the heating of thermosetting plastics for polymerization. This application has been in many individual forms, but predominant has been the preheating of preforms for transfer molding. The conventional method of heating is to use a small electrical oven to raise the temperature to approximately 350° F at which curing takes place. The preform may range in size from thin wafers to large blocks of material, and as the size goes up, the difficulty to heat it uniformly by oven means goes up as some high power. As the contribution of transfer molding to the plastics industry has been in the direction of larger products, it can be seen that the whole scheme was greatly limited by the inability to uniformly heat the preforms. The crust action, as in the loaf of bread, set the outside of the preform while the inner portion still remained uncured. Dielectric heating enabled the plastics manufacturer to uniformly heat this material, thus speeding up the heating cycle, and at the same time, making the material much more fluid from a molding standpoint. This latter quality permitted much faster press closing, much less wear and tear on dies, and an all-round superior product. Since dielectric heating is actually intermolecular heating, the improved curing of plastic material is believed to be a result of this. In other words, by working directly on the molecules, an acceleration of the polymerizing, which is itself a molecular reaction, takes place.

Setting of Thermosetting Glues

Another application of dielectric heating in the plastics has been in the setting of thermosetting glues. The conventional approach was to heat the entire object up to curing temperature, a bulky and wasteful process. Because of the difference in the loss factors, for instance, between wood and the glue, the glue alone can be heated by dielectric equipment and polymerized without wasting time and energy to heat up the entire mass. In some cases where the glue line is in actual contact with the electrodes, a combination of dielectric and resistance heating occurs, but even under such conditions the resistance heating component is aggravated by the high frequency of the impressed voltage.

Dehydration

Drying, or dehydrating, is also a field where dielectric heating has proven its worth; the particular contribution being again its ability to heat the innermost portions of material without overheating the surface. However, considerable amounts of energy are required to evaporate the moisture after it has been brought up to boiling point, and it is sometimes more economical to combine dielectric heating with a conventional form so that the dielectric process raises the temperature and the oven or kiln supplies the energy for evaporation. The rate of energy input must also be controlled to prevent damage to the product from steam pressure being built up internally, as was the case with an installation for drying ceramic ware prior to firing. Flat type electrodes caused too high a degree of center heating, and finger electrodes which heated the surface gave the steam a chance to escape through the porous material without causing any damage from internal pressure.

An example of the use of the cylindrical electrodes previously mentioned is in the manufacture of filter inserts for oil and water filters. The particular process consists of winding paper on a mandrel endwise so that a tube of spirally wound paper results. This paper is impregnated with a thermosetting resin which must be cured and the conventional method was to have removable mandrels which could be placed in an oven. By using high-frequency electronic heat, a cylindrical electrode was placed around the rotating mandrel and the filter pack fed continuously through it. Since the mandrel was at ground potential, and the electrode several thousand volts above ground at a frequency of approximately 20 megacycles, the tightly wound paper was heated as it passed through the electrode cylinder, and emerged completely cured and ready for use. The gain in production efficiency is obvious.

Example after example could be given for the uses of dielectric heating but space does not permit it. However, one more bears mentioning, because of its widespread possibilities in the food world. The beef cattle of South America represent a vast source of supply for world consumption with the one drawback of the ever-present hoof-and-mouth disease. In order to kill the hoof-and-mouth virus retained in the meat of infected cattle, it is necessary to hold this meat at a temperature of approximately 160° F for a period of about two or three minutes. Since beef, and in fact all meat, has a very poor thermal conductivity, specifications demand that the flesh be held at a temperature of around 400° F for three hours to insure that the virus-killing heat will penetrate to the innermost section. This "cooking" results in a gray unappetizing pulpy mass, which has very little market. Tests have demonstrated conclusively that dielectric heating can uniformly heat the meat to the 160° F value and hold it there for the prescribed time with practically no effect on its taste or appearance. This method, tied in with deep-freezing, seems in all likelihood to be the answer to the hoof-and-mouth infected meat problem.

It is hoped that the facts presented herein will be a stimulus for further advancement in the art of high-frequency dielectric heating, as well as a means of giving to industry the history of the applications which have already been developed. Though it may appear that considerable experimentation is necessary to determine whether or not a particular problem can be solved, much work has been done in the laboratories, and large amounts of data are on hand to assist in this direction. Standard high-frequency oscillators of practically any power output are available, eliminating any specially constructed equipment. These oscillators are especially designed for industrial use; an important point because induction heating experience with electronic equipment has demonstrated that an excellently designed radio transmitter is likely to be a poor industrial piece of apparatus. The output envelope waveshape of the dielectric oscillators is purposely made to have a low ratio of peak value to rms*, since the peak value is the one that causes flash-over, and the rms is the one that does the heating. This is simply an example of the "good engineering" that has gone into the production of equipment to make it fool-proof and dependable in the production line. All indications are that "dielectric heating is here to stay".

*rms = root-mean-square, the square root of the means of the squares of the instantaneous values of an alternating current over a complete period—the effective value of the alternating current.

A TIME ESTIMATE FOR AN INJECTION MOLD

Part III

by Gordon B. Thayer
PLASTICS RESEARCH ENGINEER
Dow Chemical Company

Estimate of Cavity Backing Plate

The list of operations and the time estimates for the cavity backing plate are itemized as shown in column two.

Estimating the cavity backing plate involves the use of one new table of time values. This is Fig. 15, Time Values for Material Removal, which is used to estimate the time to mill the clamp grooves.

A consideration of the factors involved in machining open contours and spaces reveal that time consumption is dependent upon the number of cubic inches of material to be removed, the hardness of the steel, the tolerances which apply, and the shape, or contour factor. Figure 15 is set up to allow for these four factors. The table shows basic time values for machining oil hardening tool steel, or alloy mold steel—in the annealed condition—machined to tolerances of plus or minus .005". A factor of 70% applies when cold rolled or machine steel are used. When the number of contour units in a part is four, the basic table values apply. Corrections are shown to allow for other contour requirements.

Contour units have been described in detail in connection with layout estimating. Machining time is closely related to contour layout time and the material removal time is allowed in proportion to the number of contour layout units.

Example of Material Removal

A simple example of the use of the material removal time values is shown by Fig. 16, "Cubic Inch Method of Estimating Material Removal".

The left hand view represents a piece of steel in which a T-slot is to be machined. The dimensions show that the area of the material which is to be removed is 3 square inches. The block is 1" thick and the table in Fig. 15 shows 1.6 hours as the time required to remove the material, under the basic con-

CAVITY BACKING PLATE ESTIMATE

Cut off Stock	1½" x 6" x 8" (Fig. 2) Large flat stock, edgewise cut, set up time 6" depth of cut	 .1 hr. .2 hr.
Square ends	1½" x 6" x 8" (Fig. 7) Machine two sides, 1.2 hr. x ⅓ x .7 set up time for two sides	 .3 hr. .1 hr.
Turn locating boss and bore central hole	3" avg. dia. (Fig. 4) 1½" deep .8 hr. x .7 add, for turning boss	.6 hr. .5 hr.
Layout	Six holes for common centerlines	.6 hr.
Mill two clamp grooves	Three layout units per roove ¾" wide x ½" deep x 6" long, or 4½ sq. in. x ½" deep. From Fig. 15, 1.3 hr. x .5 x 2 x .7	.9 hr.
Drill and counterbore for mounting screws	Six holes, ⅜" dia. (Fig. 14)	.7 hr.
Total Estimated Time for Cavity Backing Plate		4.0 hr.

Time Values for Material Removal

SQ. INCHES	½	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DEPTH IN INCHES																	
⅛	.6	.6	.6	.6	.6	.6	.7	.7	.8	.8	.9	.9	1.0	1.0	1.1	1.1	1.2
¼	.6	.6	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
½	.6	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
¾	.6	.7	1.0	1.3	1.7	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4
1	.6	.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8
1¼	.7	1.0	1.4	1.9	2.4	2.9	3.4	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.4	7.9	8.4
1½	.7	1.0	1.7	2.2	2.8	3.4	4.0	4.6	5.2	5.8	6.4	7.0	7.6	8.2	8.8	9.4	10.0
2	.8	1.2	2.0	2.8	3.6	4.4	5.2	6.0	6.8	7.6	8.4	9.2	10.0				
3	1.0	2.2	3.4	4.6	5.8	7.0	8.2	9.4	10.0								

TIME IN HOURS

Time values apply for 4 units
For less than 4 units deduct 50%
For 5 to 8 units add 100%
For 9 to 12 units add 200%
For 13 to 16 units add 300%

Time values apply for ±.005" finishing tolerance
For ± .004" add 20%
For ± .002" add 50%
For ± .001" add 100%

Fig. 15

Cubic Inch Method of Estimating Material Removal

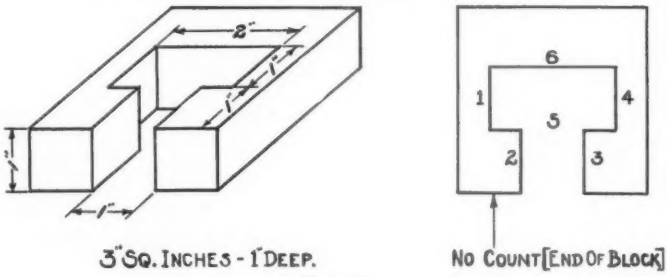


Fig. 16

ditions. Now, in the right hand view of the block are shown the layout contour units, one for each straight line or continuation thereof. There are six contour units, and the material removal table instructs the estimator to add 100% to the basic table value if there are between 5 and 8 contour units. Thus the estimate is increased to 3.2 hours to machine the T-slot in oil hardening tool steel to plus or minus .005", by the application of the correction for the number of contour units.

If the finishing tolerances were plus or minus .002", an additional 50% of the computed time, including allowance for contour units, is to be added. This would amount to 50% of 3.2 hours or

CORE BACKING PLATE ESTIMATE

Cut off stock	1½" x 6" x 8", same as for cavity backing plate	.3 hr.
Square ends	same as cavity backing plate	.4 hr.
Layout (See Fig. 9)	12 holes for screws on five center lines—5 units	.5 hr.
	4 holes for return pins, on 4 center lines—4 units	.4 hr.
	1 hole for sprue ejector on 2 center lines—2 units	.2 hr.
	18 holes for ejector pins— same as on core retainer plate	.6 hr.
Drill, ream, counterbore (See Fig. 14)	Drill & ctbr. 6 holes, ⅜"	.6 hr.
	set up time	.1 hr.
	Drill & tap 6 holes, ⅜"	.6 hr.
	set up time	.1 hr.
	Drill & ream 5 holes, ⅜"	.5 hr.
	set up time	.1 hr.
	Drill, ream, & ctbr. 18 holes, ⅛"	1.8 hr.
	set up time	.1 hr.
	Location tolerance, allow 100%	1.8 hr.
Total Estimated Time for Core Backing Plate		8.1 hr.

Time Values for Peen Heading Small Pins

Diameter up to 1/16"	.05 hr. each
Diameter 1/16" to ⅛"	.1 hr. each
Diameter ⅛" to ⅜"	.2 hr. each
Diameter ⅜" to ½"	.25 hr. each

Fig. 17

SPACER BAR ESTIMATE

Cut off stock	1½" x 3" x 8" (Fig. 2)	.2 hr.
Square ends	1½" x 3" machine two ends (Fig. 7) 1.0 hr. x .7 x ¼	.2 hr.
	set up time	.1 hr.
Layout	Six holes for screws—on 7 centerlines—7 units	.7 hr.
Drill	Six holes, ½" dia.	.6 hr.
Total Estimated Time per Spacer Bar		1.8 hr.

1.6 hours, and then the time estimate would become 4.8 hours. Note that the allowance factor for tolerances other than plus or minus .005" is applied after the sum of the table value and the allowance for contour units is obtained. If machine steel or cold rolled steel is the material, the table value is to be multiplied by .7 or 70%, and the contour and tolerance time allowances are to be computed from the table value adjusted to take into account the kind of steel.

The clamp grooves in the cavity backing plate may now be computed by the use of Fig. 15 and the instructions just outlined. The time, .9 hours is derived as shown in the notes within the itemized list of operations. The value 1.3 hr. is obtained by interpolation between 4 and 5 sq. in. (Fig. 15), the value .5 is the correction for less than 4 units (Fig. 15), there are two grooves and as the cavity backing plate is CRS, .7 of the indicated value (page 134 September issue) is used.

The core backing plate is itemized and estimated in a form similar to that used for estimating the cavity backing plate.

REAR ADAPTOR PLATE ESTIMATE

Cut off stock	1½" x 6" x 8" Same as cavity backing plate	.3 hr.
Square ends	1½" x 6" x 8" Same as cavity backing plate	.4 hr.
Turn locating boss and bore central hole	Same as cavity backing plate	1.1 hr.
Layout	Six holes on common centerlines	.6 hr.
Mill clamp grooves	Same as cavity backing plate	.9 hr.
Drill and counterbore for mounting screws	Same as cavity backing plate	.7 hr.
Total Estimated Time for Rear Adaptor Plate		4.0 hr.

The ejector box is the next item on the parts list. It consists of three pieces of steel, two spacer bars just alike, and a rear adaptor plate. The time estimates for the parts are itemized as shown:

Two more plates remain to be estimated to complete the group of mold plates. These are the ejector pin retainer plate and the ejector pin assembly plate.

The next three items in the list of parts are small pins, and they are similar in nature. It is probable that their manufacture would be carried out by making the pins all at once. For this reason, the estimate for the various pins are itemized together.

(TO PAGE 134—PLEASE)

EJECTOR PIN RETAINER PLATE ESTIMATE

Cut off stock	⅝" x 3" (Fig. 2)	.1 hr.
Square ends	(Fig. 7)	.2 hr.
Layout (See Fig. 9)	Six screw holes—6 units Four return pin holes—4 units 1 sprue ejector hole—1 unit 6 groups of 3 ejector pin holes	.6 hr. .4 hr. .1 hr. 1.8 hr.
Drill and countersink (See Fig. 14)	Six screw holes, ⅜" dia. drill and ctbr. Set up time 4 return pin holes and 1 sprue pin hole, ⅜" dia. Set up time 18 ejector pin holes Set up time Location allowances, 100%	.6 hr. .1 hr. .5 hr. .1 hr. 1.8 hr. .1 hr. 1.8 hr.
Total Estimated Time for Ejector Pin Retainer Plate		8.2 hr.

EJECTOR AND RETURN PINS ESTIMATE

Cut off stock	18 pc. ⅛" dia., 5 pc. ⅜" dia., 23 cuts at .03 hr. per cut	.7 hr.
Peen ends	18 pc. ⅛" dia. 5 pc. ⅜" dia. (Fig. 17)	3.6 hr. 1.5 hr.
Face both ends to length	23 pins at .2 hr. each Allowance for measuring thickness of mold plates	4.6 hr. 1.0 hr.
Harden	23 pins at .2 hr. each. Omit allowance for drawing temper. (Fig. 5)	4.6 hr.
Clean up and fit after hardening	23 pins at .1 hr. each	2.3 hr.
Total Estimated Time for Pins		18.3 hr.

EJECTOR PIN ASSEMBLY PLATE ESTIMATE

Cut off stock and square ends	Same as pin retainer plate	.3 hr.
Layout	Six screw holes	.6 hr.
Drill and Tap	Six screw holes Set up time	.6 hr. .1 hr.
Total Estimated Time for Ejector Pin Assembly Plate		1.6 hr.

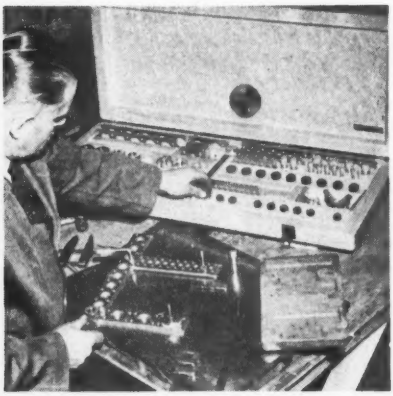
GUIDE PIN ESTIMATE

Cut off Stock	1⅛" dia. x 2½" long. (Fig. 2)	.1 hr.
Turn and Face to length	¾" dia. x 2¼" long	.8 hr.
Harden	lots of 3 to 6 (Fig. 5)	.2 hr.
Grind	Same as turn and face	.8 hr.
Total Estimated Time per Guide Pin		1.9 hr.

"BORLOCATOR" JIGS & FIXTURES

• TDJ Picture Story

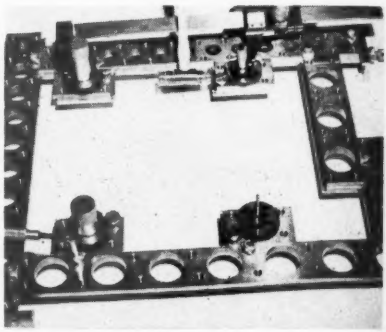
An ingenious and yet highly practical approach to fulfilling the need for "prefabricated" jigs and fixtures is embodied in the "Borlocator" a new development by Steel Tools, Inc., of Cleveland. Rather than a device, the Borlocator can be considered a method whereby an infinite variety of production and/or inspection



jigs and fixtures can be readily and accurately assembled.

The Borlocator consists of a set of 150 precision components including master location plates that can be assembled to conform to any layout by means of special locking clamps and screws; combinations of drill jig bushings, drill bushing adapters and lock screws are mounted on the location plates according to the specified center distances of the holes to be drilled or inspected.

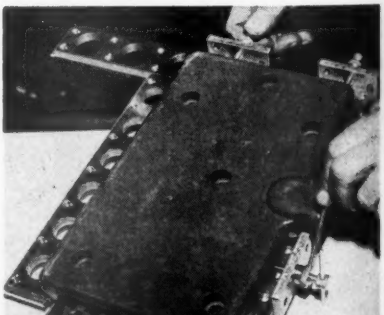
Before the final "locking up" of the assembly of location plates and drill bushings, locating pins are inserted in the bushings. With a vernier caliper set for hole center-to-center distance plus



one-half the diameters of the respective locating pins, measurements are made "over the pins" of any pair of bushings and a light tapping of one bushing plate permits locating to the final thousandth or less.

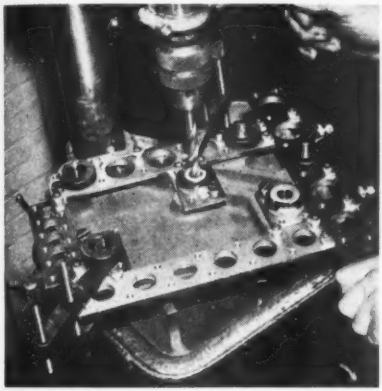
Adjusting blocks and screws are provided which may be positioned at appropriate locations around the outside of the whole assembly so that the fixture will locate properly and uniformly on a given run of castings or work pieces.

Borlocators are being used for inspection fixtures as well as production jigs. By means of a master assembly of bushings and pins set up as a multiple plug gage, inspections may be made of hole



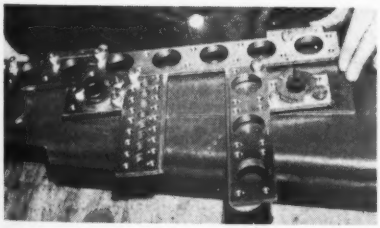
center locations; and by means of the adjusting or positioning blocks the hole locations may be checked relative to the outer edges of a work piece.

The location plates are chrome plated and are precision made, straight, parallel and square. They may be assembled end to end, side by side, or end to side. The interlocking grooves of the plates incorporate a half-wedge in their cross-section so that when two plates are mated a full wedge is formed with the



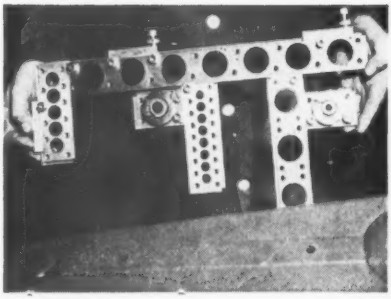
result that the contacting areas of any two locked plates are under compression. This insures accuracy and rigidity.

The location plates are mated or fastened together by the locking clamps and screws. The clamps are so designed that



as the screws are tightened the clamping action is one of compression, there being no tendency toward a lateral shift. Thus, after the exact positioning of one location plate in relation to another the accuracy of the judgment is not upset by the final clamping action.

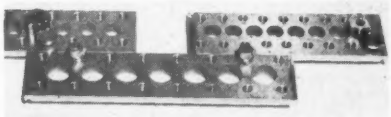
The location plates have holes at uniformly fixed and accurate center distances. These holes accommodate the



drill bushing adapters by means of which a great variety of combinations of bushing OD's and wall thickness can be accommodated at each hole position.

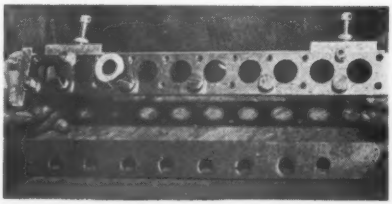
The standard Borlocator set has a variety of location plates having different sizes and spacings of bushing adapter holes. As provided, these hole center distances will be found appropriate to many simple jobs where only one location plate is used for locating a series of holes, such as a row of holes in a structural angle member.

Two location plates can be clamped together and so displaced laterally as to give an infinite variety of hole center



distances. Location plates can be ordered having any specified hole size and center distances.

There is an adequate provision of tapped holes for both the bushing adapter lock screws and the location plate clamping screws so that regardless of the intricacy of any jig assembly there will always be a sufficient number of holes "within reach" for the locking and clamping functions.



Time Estimate for Mold

(CONTINUED FROM PAGE 131)

Peening of Pin Ends

In the estimate for the pins, an operation appears which has not been mentioned previously. This is peening the ends of the pins to form the heads. This method of heading ejector pins by peening them cold with a hand hammer into a split die held in a vise is acceptable for plastics mold work. It is considered to be more practical for small pins and more economical than turning shoulders on them. In Fig. 17 are tabulated time values for peen heading small pins for plastics molds.

In estimating the hardening time for the pins, the allowance for drawing the heads to a soft temper is omitted. This is because the time allowance is somewhat generous when such a large number of pins is being handled at one time. The cutting off operation was likewise made less than table values shown because of the small size of the pins.

GUIDE PIN BUSHING ESTIMATE

Cut off Stock	Same as guide pin	.1 hr.
Turn and face to length	1⅛" dia. x 1¼" long (Fig. 2)	.8 hr.
Bore	¾" dia. x 1½" long (Fig. 4)	.8 hr.
Harden	Same as guide pin	.2 hr.
Grind	Same as turning and boring	1.6 hr.
Total Estimated Time per Guide Pin Bushing		3.5 hr.

SPRUE BUSHING ESTIMATE

Cut off Stock	1¼" dia. x 2" long (Fig. 2)	.1 hr.
Turn and face	¾" dia. x 1¼" long (Fig. 3)	.7 hr.
	Add 50% to machine spherical seat for nozzle	.4 hr.
Drill and ream tapered hole	$\frac{3}{16}$" dia. hole (Fig. 14)	.1 hr.
	Allowance for taper reaming	.1 hr.
Harden	Fig. 5	.2 hr.
Grind	Same as turning operation	.7 hr.
Polish sprue hole	1½ square inch (Fig. 6)	.5 hr.
Total Estimated Time for Sprue Bushing		2.8 hr.

The guide pins and bushings are next in the list of parts to be estimated. Standard pins and bushing which may be purchased from supply house stocks are often more economical to use, but, because plastics molds often are special even to guide pin requirements, the estimates are made here.

The last item on the list of parts to be estimated is the sprue bushing.

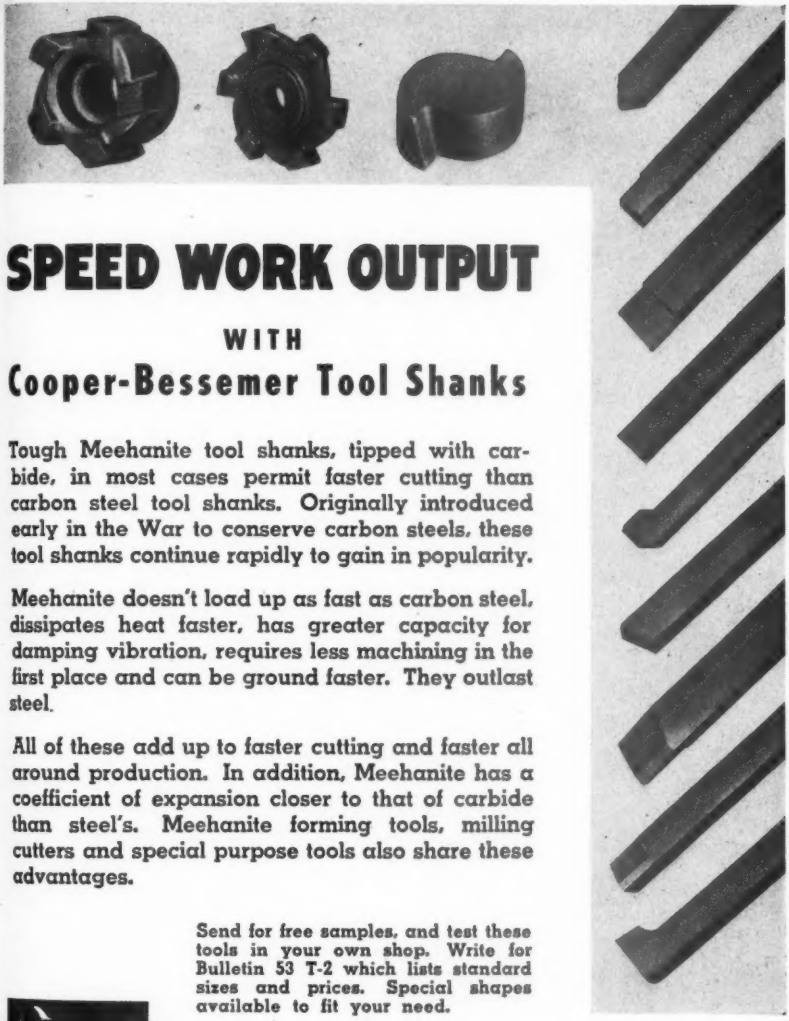
Now that all of the individual parts and templates have been estimated, a summary should be made to determine the total number of hours estimated for the mold. The summary is below.

The total estimated time for the injection mold is seen to be 175 hours. This time excludes time required to assemble the mold and make adjustments required to put it in good running order. In well managed molding plants, this may vary from 2 to 30 hours. If the mold is similar to molds already in operation, the tryout time will be a minimum because of previously acquired experience and knowledge of what to do to design and build the mold for best operation. If the mold is not simple in nature, or if it is the first of its kind more time for tryouts and revisions must be allowed.

TOTAL TIME ESTIMATE FOR INJECTION MOLD (Fig. 1)

Cavity Blocks	6 pc. at 6.7 hr. ea.	40.2 hr.
Templates		4.0
Form tool		2.0
Core Blocks	6 pc. at 4.3 hr. ea.	25.8
Template		4.0
Form tool		2.0
Cavity Retainer Plate		14.7
Core Retainer Plate		15.5
Cavity Backing Plate		4.0
Core Backing Plate		8.1
Ejector Box	2 spacers at 1.8 hr. ea.	3.6
	rear adaptor plate	4.0
Ejector Pin Retainer Plate		8.2
Ejector Pin Assembly Plate		1.6
Ejector and Return Pins		18.3
Guide Pins	3 pc. at 1.9 hr. ea.	5.7
Guide Pin Bushings	3 pc. at 3.5 hr. ea.	10.5
Sprue Bushing		2.8
	Total	175.0 hr.

Mr. Thayer's next article will be a Time Estimate for a Compression Mold with hobbed cavities and milled cores. The estimate will cover further use of the Material Removal Table, the estimate of a hob, (Table of Hobbing Time), drilling steam plates and the ejector system.



SPEED WORK OUTPUT

WITH

Cooper-Bessemer Tool Shanks

Tough Meehanite tool shanks, tipped with carbide, in most cases permit faster cutting than carbon steel tool shanks. Originally introduced early in the War to conserve carbon steels, these tool shanks continue rapidly to gain in popularity.

Meehanite doesn't load up as fast as carbon steel, dissipates heat faster, has greater capacity for damping vibration, requires less machining in the first place and can be ground faster. They outlast steel.

All of these add up to faster cutting and faster all around production. In addition, Meehanite has a coefficient of expansion closer to that of carbide than steel's. Meehanite forming tools, milling cutters and special purpose tools also share these advantages.

Send for free samples, and test these tools in your own shop. Write for Bulletin 53 T-2 which lists standard sizes and prices. Special shapes available to fit your need.

THE Cooper-Bessemer CORPORATION

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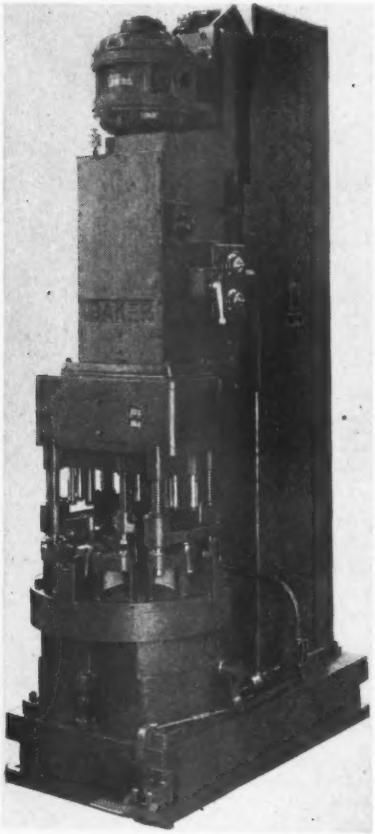
Hydraulic Feed Drilling Units

Of particular interest to postwar planners of high production, special purpose equipment are the self-contained, hydraulic feed units by Baker Brothers, Inc., of Toledo, Ohio. These units are



flexible in application and are easily adjusted to different job requirements as to feed travel and rate. They are readily adaptable to single and multiple drilling, boring, counterboring, reaming, hollow milling, chamfering and facing operations.

The unit head, body and saddle are integral and are gibbed to the base over ways 9" in width. Depending on the application, either multiple heads or a single spindle extension may be mounted directly on the front flanged head plate. The hydraulic system is self-contained in the head housing, the hydraulic cylinder being fixed to the moving head housing, with the piston rod secured to the stationary base. The standard unit is designed for high production and incorporates a direct coupled motor drive to the spindle, the speed of the latter being geared according to the job specification. For lower production requirements and for diversified operation the unit may be had special with speed change pick-off gears. In such cases the motor is mounted on top of the unit and employs vee-belt drive.

The hydraulic feed is actuated through a control panel, providing a two-feed cycle which is standard. Also procurable is a feeding cycle of positive stop and delayed reverse, and the units also can be furnished with a jump feed cycle attachment. Illustrated herewith is a Baker Hydraulic Feed Unit application as a vertical multiple spindle driller having a hand actuated indexing table. *INFORM-A-GRAM KEY NO. A63-Q.*

Walton Simplifies Broken Tap Removal

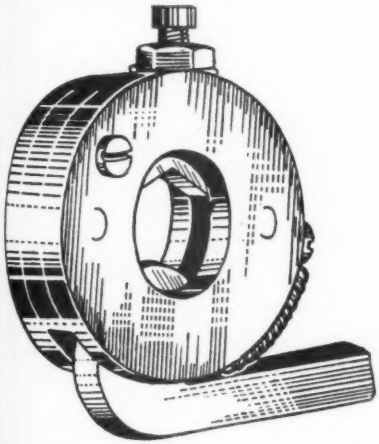
The danger of expensive work being reduced to scrap because of a broken tap can be to a great extent eliminated by the use of Walton Tap Extractors. Established and proved over so many years as to have become a standard practice, the extractors grip the broken tap firmly so that it can be backed out easily, without damage to the threads or work. No annealing, drilling or special tools are required. Walton Tap Extractor holders, collars and sleeves are guaranteed against breakage; should any of those parts break they will be replaced without charge. Production-range sets are offered including the commonly used sizes of the 4-flute style of extractor. Substitution of 3-flute and 2-flute styles may be made at no extra cost. Detailed specifications and literature illustrating methods of operation may be had on request from The Walton Company, 94 Allyn Street, Hartford 3, Conn., or by use of our

INFORM-A-GRAM KEY NO. B82-Q.

PROGRESS ON PARADE

Use our postage-free Inform-a-Gram for your requests.

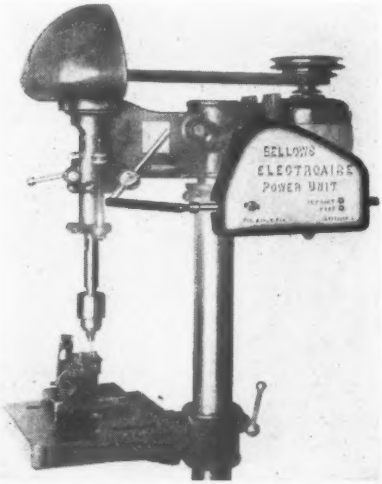
THE QUIK CLAMP DOG manufactured by Quik Clamp Manufacturing Co. is a quick-acting, positive gripping dog with an adjustable jaw which will not mark the parts which are being ground. It can be used on hardened or soft shafts and will accommodate several sizes. The Quick Clamp Dogs, it is claimed, are especially adaptable to production work, parts either machined or ground between centers. Since a wrench is not required on the dogging work, the operator can load and unload the dog as fast as he can pick up or lay down a piece part. The Quik Clamp Dogs are made in two types—grinding dogs and lathe dogs—and are available in nine sizes to accommodate diameters from ⅛" to 2½". Write the QUIK CLAMP MANUFACTURING CO., 6313-15 Capulina Ave., Morton Grove, Ill., for detailed information.



INFORM-A-GRAM KEY No. B62-Q

THE ELECTRICALLY CONTROLLED AIR POWER FEED recently announced by The Bellows Co. of Akron, O., provides automatic tapping on almost any type of drill press. This new Electroaire Power Feed utilizes a solenoid controlled Bellows Air Motor to advance and retract the spindle. Feed and retraction speeds are independently controlled and are subject to infinite variation. Down feed is held under exact, sensitive pressure at all times, preventing thread forcing. Operation of the feed is controlled by a foot switch, leaving the operator with both hands to insert and remove the work. The feed may be synchronized to solenoid controlled jigs, work feeds and fixtures to make the entire operation automatic. The Power Feed may be set for multi-cycle operation with indexing fixtures and dial feeds. The Bellows Electroaire permits high speed automatic drilling with wire size drills. Stroke is adjustable up to a maximum of an inch and a quarter. THE BELLOWS COMPANY, Akron, O., will forward additional information on request.

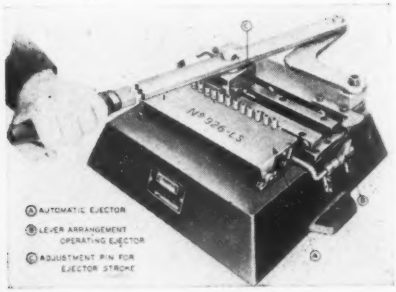
INFORM-A-GRAM KEY No. 839-Q



GAGE LUBRICANT. The CMD Center Point Lubricants for use on various gage surfaces, has been found to reduce wear, inspection time and prevents the sticking of overworked plug, ring, snap or thread gages. This lubricant will not corrode the surfaces and can therefore be used as a rust preventative over the entire gage. It also protects gages from

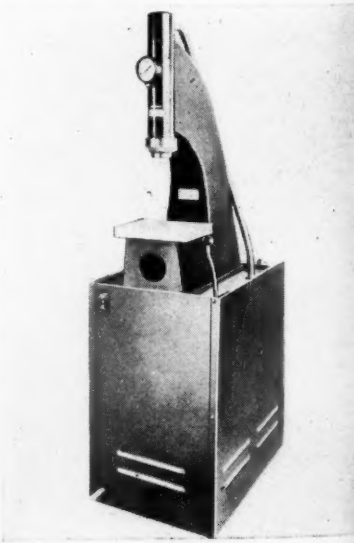
corrosion caused by acids from the operators' hands. It is claimed a wiping film of oil will last from one to two hours on any size gage. The same procedure is followed when storing gages. CMD Center Point Lubricant is manufactured by CHICAGO MANUFACTURING & DISTRIBUTING COMPANY, 1928 West 46th St., Chicago 9, Ill., who wil send a sample and more information on request.
INFORM-A-GRAM KEY No. 590-Q

A NEW BENCH MARKING MACHINE has been developed by The Acromark Co. to mark ferrules, fittings, caps, adaptors, thin walled tubular sections and other parts requiring an abbreviated designation. This model, No. 926LS, features an easily accessible open face loading arrangement with an automatic ejector. It is easily loaded and as many as twelve parts may be marked with a single stroke of the operating lever. Letters or figures can be interchanged in the die holder or solid dies may be substituted where marking changes are few. Adjustments in marking depth may be made for different materials and thicknesses. The entire interchangeable

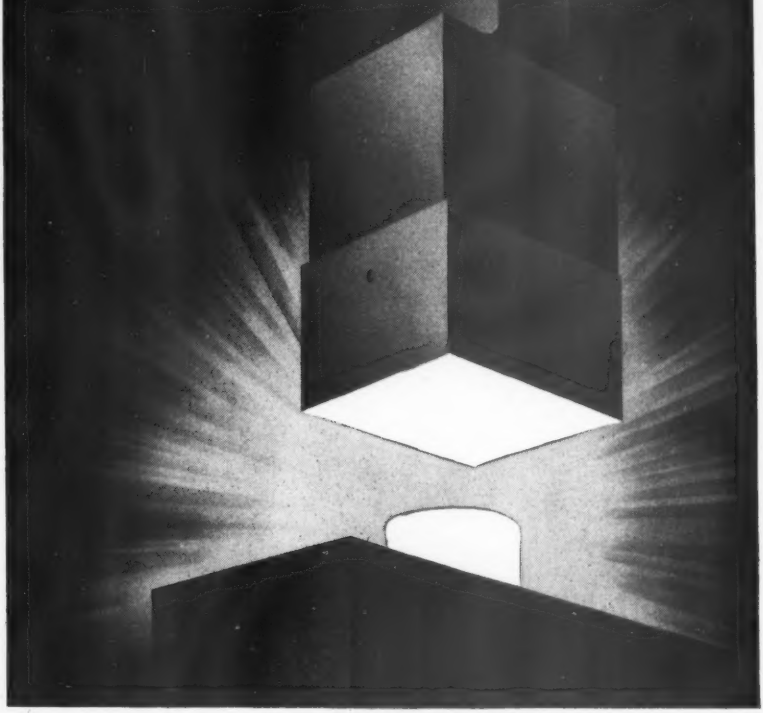


mandrel is exposed by removing two spring chips. The base of the machine is of cast iron. Adjustment for wear in the slide is provided by means of a steel gib. Bronze bushings are standard at critical points of wear. THE ACROMARK CO., 5-15 Morrell St., Elizabeth 4, N. J., will send complete information and details of its application.
INFORM-A-GRAM KEY No. 636-Q

HY-SPEED GAP MOTORIZED PRESS. The new 10 and 20 ton presses manufactured by Reimuller Bros. Co. are used for the production line work of marking, forming, notching, pressing, broaching, assembling and other operations. A hand lever hydraulic valve controls the ram movement through feed, hold or return positions. Other features are: hollow large area ram for holding punches and other fixtures; lapped ram; packless design; twin pressure gages showing pressure and tons. The stroke of the ram is 12". The presses are made in two models of 10 and 20 ton with 10% extra tonnage available. The motor driven hydraulic pump furnishes one and three-quarters gallons of oil per minute to the ram giving 1.5" per second ram speed in the 10 ton and .8" per second for the 20 ton. The 10 ton press furnishes four complete strokes per minute and the 20 ton furnishes two. The unit is equipped with a 220/60/3ph motor as standard equipment. Flexible lines are used throughout, simplifying setup. Descriptive literature and prices may be had by addressing REIMULLER BROTHERS CO., 9400 Belmont Ave., Franklin Park, Ill.
INFORM-A-GRAM KEY No. 902-Q



Molybdenum die steels serve particularly well where heavy dies require deep hardening.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

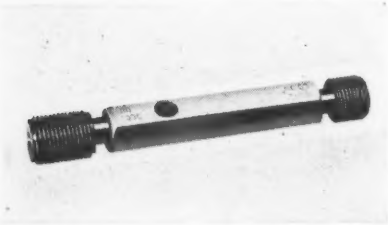
MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

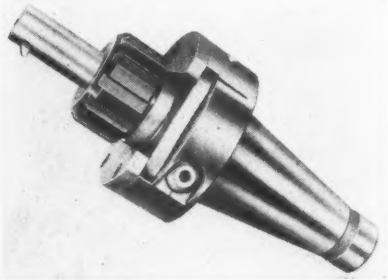
MOLY

CARBIDE THREAD PLUG GAGES. Extreme care in grinding operations is the principal factor in making the Jansson Gage Co.'s line of carbide thread plug gages accurate to exceptionally close tolerances. The wear-resisting properties of carbide make possible continued accuracy over longer periods of time and permit more gaging operations to be performed before checking or refinishing of the



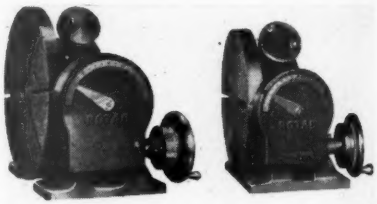
gages if necessary These gages are offered in three styles, made to American Gage Design standards. Solid carbide is used for the smaller size gaging members while the larger sizes have a carbide bushing over a steel body. A complete size range is available from .112" to 3", accurately ground to Class X or Class Y tolerances. The JANSSON GAGE CO., Dept. T, 19212 Glendale Ave., Detroit 23, Mich., will send additional information.
INFORM-A-GRAM KEY No. 1-Q

A NEW BORING CHUCK, recently announced by the Universal Engineering Co., has been designed to hold boring bars. Although it has all the features of a Universal Collet Chuck, the boring chuck provides for the bar to be advanced or receded a distance to suit the work. The offset slide is held rigidly and, in the box design, the adjustment in a lateral direction may be made by simply tightening the screws. The flat retainers may be tightened to grip the bar rigidly or to allow the correct and required amount of tension. In the event of wear, grinding down the face of the chuck will bring the flat retainer



to the proper adjustment. The anti-back-lash arrangement of the adjusting screw provides extreme accuracy with this new chuck. Hole sizes to .0005" may be bored depending on graduations only. Universal Boring Chucks are available in two types to accommodate bars from ⅜" to ¾" and to accommodate bars from ½" to 1". UNIVERSAL ENGINEERING CO., Frankenmuth, Mich., will send details on request.
INFORM-A-GRAM KEY No. 276.5-Q

TWO NEW ROTABS. To broaden the scope of applications of the Rotab where machining or checking of unusual angles must be performed, the Machine Products Corp. have developed two new sizes—a 12" and a 24" Rotab. The 12" model is particularly adapted to milling operations and is easily mounted on the table of a milling machine. It is similar to the original Rotab (36") in that it has a rotating table to which the work is clamped. The table can be turned to any degree and will assume any position radially in addition to permitting its plane to be fixed to any

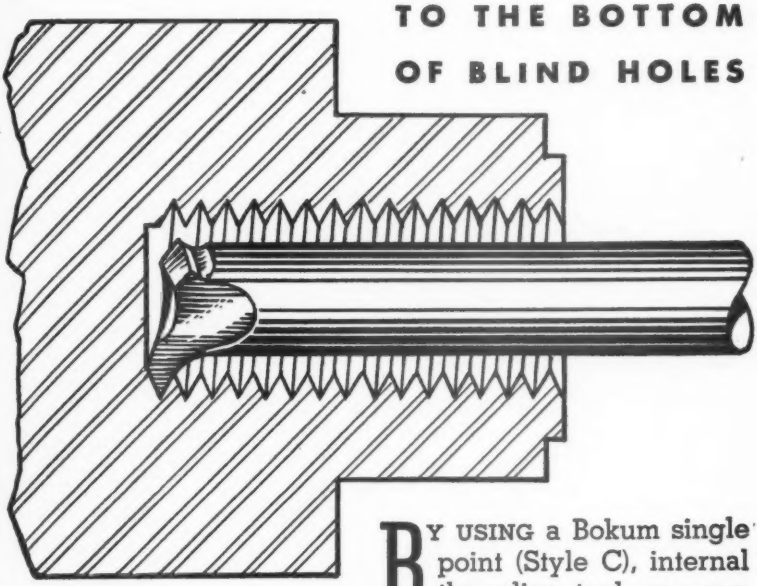


angle, vertical to horizontal, and even to a position 30 degrees in the opposite direction without disturbing the initial clamping of the work. The 12" model weighs 125 lbs. The 24" Rotab is adaptable to a wide range of milling and boring operations and weighs 688 lbs. Both models have dials showing degree and minute graduations which register the angle of setting. An adjustable degree ring is under the face plate to avoid excessive turning of the handwheel to obtain the zero setting. More information about the Rotab can be obtained from MACHINE PRODUCTS CORP., Dept. TJ, Detroit, Mich.
INFORM-A-GRAM KEY No. 144-Q

A NEW ⅜" IMPACT WRENCH that operates with controlled torque has been announced by The Aro Equipment Corp. This pneumatically powered tool completely prevents stretching or "burning" of threads and is capable of both forward and reverse rotation. A calibrated adjusting screw on the side of the motor enables the operator to set any bolt or nut to any desired tension. Control is obtained primarily through the construction of the roller clutch impacting mechanism which consists of an anvil, hammer and two cylindrical steel rollers. The centrifugal force throws the two steel rollers out against the

How To Make *PERFECT THREADS*

TO THE BOTTOM OF BLIND HOLES



BY USING a Bokum single point (Style C), internal threading tool, you can produce threads clear to the bottom of blind holes. The shank being in line with the cutting edge of tool, the angles of all the threads are perfectly true. Sharpening is done on only one face without disturbing or changing the angle. No other tool like it.

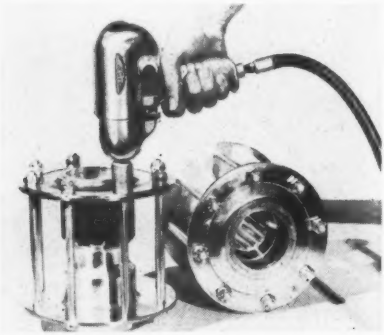
Bokum tools of the same type are also available for general boring (Style A), and for bottoming and facing (Style B).

Ask for Catalog E-1139 for Super High Speed Tools, and for E-398 for Carbide Tipped Tools.

BOKUM TOOL CO.

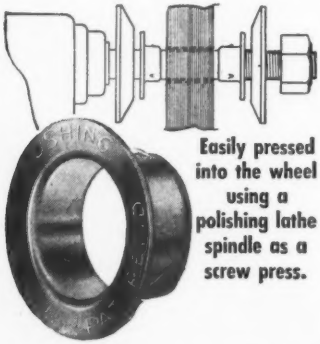
14775 WILDEMERE AVE. • DETROIT 21, MICH.

hammer where they are caught in shear between the hammer and anvil members. This transfers the full torque through to the work in the form of a sudden impact. The rollers rebound from the anvil face and prevent the hammer from engaging for impact when the



selected torque is obtained. This Model 131, with a ⅜" bolt size capacity, is 6¾" overall in length and weighs 4¼ lbs. It comes complete with one socket and 8' ¼" hose and fittings. Further details will be sent by THE ARO EQUIPMENT CORP., Bryan, O.
INFORM-A-GRAM KEY No. 195.5-Q

STEEL BUSHINGS FOR POLISHING WHEELS. The Manderscheid Company of Chicago has recently introduced their Presto Polishing Wheel Bushings for quickly and easily changing wheels without wear to spindle and without risk to operator. Polishing wheels are eas-



Easily pressed into the wheel using a polishing lathe spindle as a screw press.

ily changed without running the spindle when equipped with Presto Bushings. The wheel is kept concentric regardless of how often removed. Uniform contact all around the wheel is assured, hence a better and faster job without waste of grain. A polishing lathe spindle will easily press the bushings into the wheel; the notches hold them in the wheel and prevent turning. THE MANDERSCHEID CO., Dept. T, 605 West Washington Blvd., Chicago 6, Ill., will send literature and if diameter of spindle is specified, a sample pair of Presto Polishing Wheel Bushings will be mailed.
INFORM-A-GRAM KEY No. B33-Q

THE STELLITE THREAD PLUG GAGES manufactured by the Cadillac Gage Co. have been found to give 5 to 20 times longer service than the steel gages previously used in the gaging of precision parts made of materials varying in abrasive qualities. This plug gage has also been shown to reduce gage costs 50% to 85%. Stellite has a lower coefficient of friction, resists wear much more effectively than steel and is never impaired

by moisture or other corrosive agents. It is also non-magnetic and has an exceptionally low affinity for other materials, making it easier to handle and obviating the tendency to seize. Stellite Thread Plug Gages are now available in all standard sizes from No. 6 to 15" in diameter and pitch diameters according to customers' specifications. Additional data will be sent by CADILLAC GAGE CO. of Detroit, Mich.
INFORM-A-GRAM KEY No. 61-Q

NEW-ALL QUICK CHANGE BOX. A new gear box attachment for Atlas, Craftsman and Logan lathes has been developed by the Western Aircraft Tool Co. which will greatly increase production. This quick change gear box is said to increase accuracy and is guaranteed to cut accurate threads from 4 to 224 per inch with approximately .003" feed for fine turning. It safeguards the product in process and eliminates loss of time in finding gears and placing them on the lathe. This box converts a standard lathe into a quick change lathe. Installation requires simply the

GRIFFIN PROCESS is applicable on thread plug gages from ½" up and on thread ring gages from 1" up.

GRIFFIN PROCESSED THREAD GAGES have all threads ground in a solid deposit of tough, wear-resistant chromium carbide alloy. Worn gages are salvaged by removing old threads, welding on a thick deposit of chromium carbide alloy and grinding new "on size" threads in the alloy. Thus, threads are ground in carbide from root to the crest—are not just a plated surface.

GRIFFIN PROCESSED THREAD GAGES give many times the service of ordinary tool steel gages because of the extreme wear resistance of the chrome carbide alloy. Average life increases are twenty times, depending upon the type of material being gaged. Users have reported up to 60 times more life in exceptional cases!

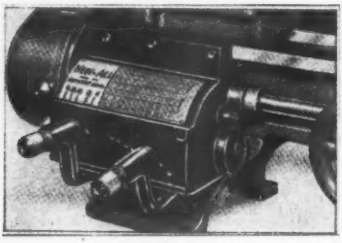
Send your old gages for reconditioning or order new gages made by the Griffin Process. Highly economical, fine workmanship, prompt deliveries! Write for our free folder describing the complete *Griffin Process* for increasing thread gage life!

GEORGE O. GRIFFIN COMPANY

1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

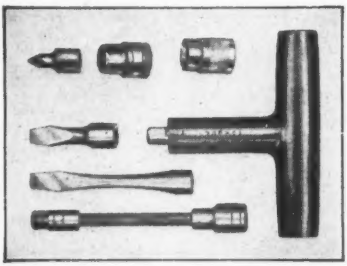
Chrome Carbide Thread Gages

drilling and tapping of three holes. The box is made of a fine grade cast iron, the gears are hobbed and of high grade steel and the lead



screw is precision turned and ground. Write WESTERN AIRCRAFT TOOL CO., 650 N. Hoover St., Los Angeles 4, Calif., for further information.
INFORM-A-GRAM KEY No. B71-Q

TORQUE WRENCH. The Skyway-T Torque Wrench manufactured by the Skyway Precision Tool Co. of Los Angeles includes a new ratcheting feature which limits the amount of torque a worker can apply to nuts, bolts, screws, clamps, etc. It tightens only to the desired torque and then automatically trips o prevent application of further pressure. This feature eliminates the shearing, stripping, warpage or failure of parts which result from overtorquing and minimizes excessive wear



or leakage due to unbalanced torquing. Overtightening jig-clamps, chucks, etc., can easily cause distortion of material to a rejection point. The Skyway-T Torque Wrenches are available in two models with torque ranges (inch/lbs.) of 2 to 50 and 7 to 125. The former is 3½" long, 3¾" wide and weighs 6 oz.; while the latter is 4¾" x 5" and weighs 12 oz. For descriptive literature, write SKYWAY PRECISION TOOL CO., 3219 Casitas Ave., Los Angeles 26, Calif.
INFORM-A-GRAM KEY No. B70-Q

OPEN STEEL GRATING & STAIR TREADS are described in an attractively illustrated booklet issued by the WM. F. KLEMP CO., Dept. TDJ, 6601 S. Melvina Ave., Chicago 38, Ill. Photographs of the products in actual plant and building uses add to detailed construction particulars, drawings and tabular specifications, providing full installation data for every requirement. Subjects covered are the uses of riveted and welded types of grating for open steel flooring, stairways, stair treads, fire escapes, loading platforms, decks for bridges and ships, automobile wash racks, drains, catwalks, tower-stairs, boiler and engine rooms, sidewalks, partitions—in all, nearly fifty of the numerous distinct services.
INFORM-A-GRAM KEY No. B14-Q

AUTOMATIC DRILLING UNIT. To meet the demand for a single purpose drill unit of trouble free operation, The Simplex Engineering Co. has designed a new Automatic Drilling Unit with as few parts as possible. By reducing the number of moving parts, wear and tear is automatically cut down and longer life can be guaranteed. This self-contained unit can be mounted at any angle or plane and operated by electrical circuits as desired.

The mounting of a number of these units in a special machine will insure rapid drilling, reaming, etc., of parts where high production is required. An illustrated folder fully describing the Simplex Automatic Drill Units will be sent by SIMPLEX ENGINEERING CO., 14519 Schaffer, Detroit, Mich.
INFORM-A-GRAM KEY No. B63-Q

STEEL STOOLS. Lyon Metal Products has recently announced that the former complete line of Lyon Stools, the production of which was curtailed early in the war effort, is again available to industrial users. The government release on steel stools provides that they be sold for industrial use on production work. Priorities required for the delivery of stools are AA-5 or better. The Lyon line includes the basic stools 18", 20", 22", 24", 26", 28" and 30" high. LYON METAL PRODUCTS, INC., Aurora, Ill.
INFORM-A-GRAM KEY No. B7-Q

MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"

"You may remember that about a year ago you sold us a Rotary Head Die Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five years ago. The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

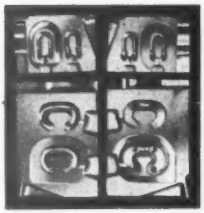
This saving would of course be increased where more than four (4) impressions are needed.

Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,
MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "



This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum—saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker Products
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

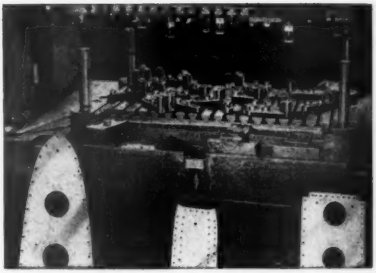
Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

ADJUSTABLE DIES
SPEED WAR PRODUCTION

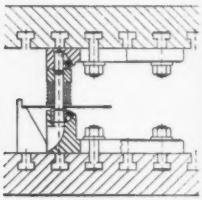
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

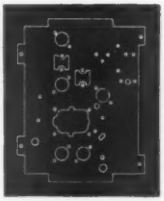
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

"Toasting" Cuts Assembly Time on Ammunition Boxes

An ingenious combination of assembly jigs and low temperature glue curing set-ups has reduced the time to cure assembled plywood PBM ammunition boxes from 3 hours to 15 minutes in the Wood Shop at the Glenn L. Martin Co., Baltimore 3, Md.

The method in use previously required two men with three jigs to make 10 boxes in 24 hours. The boxes were assembled on the jigs and baked in a curing oven for from 2 to 4 hours. The high cost of making extra jigs, the tooling time involved, skilled personnel shortage and length of the curing cycle held production of the boxes to a few at a time.

The two jigs that now do the job look very much like two bread toasters—the first, which assembled the tops and bottoms looks like a sandwich grill or

The tops and bottoms of PBM ammunition boxes are assembled in "sandwich grill" jigs. Note the simplicity of both design and operation. The knockout bar is shown on the right mold from which an assembled piece is being removed.

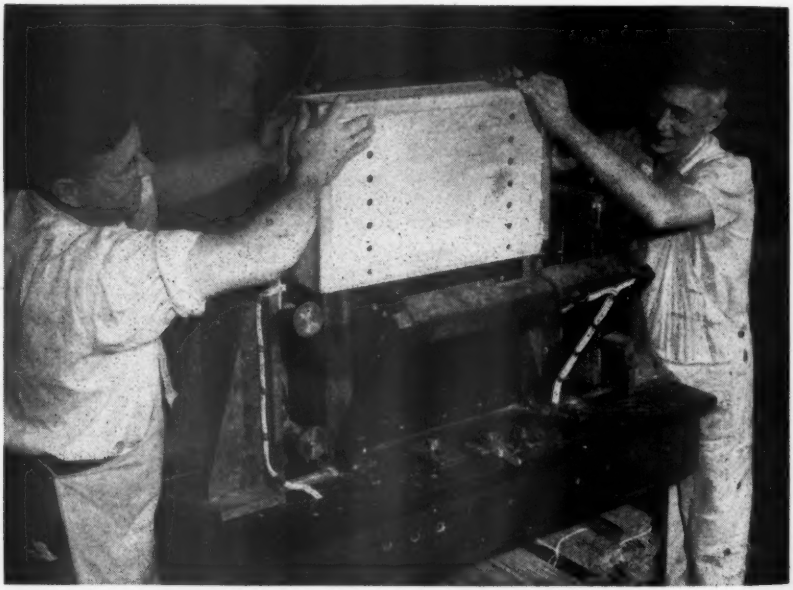
toaster, the second, in which the entire box is clamped and cured, is designed very much like an automatic pop-up toaster. P. J. Kraus, foreman of the Wood Shop was responsible for the basic idea and W. H. Bankard of the Electrical Department of Tool Design developed the glue curing heater elements. A 220 volt electric air strip heater, completely enclosed in a refractory material, was encased in a steel sheath and covered with masonite. This provided a heat of 120 degrees F without scorching the wood. The low temperature is provided throughout the curing process by thermostatic control. This method of heating is less expensive than the use of high frequency.

The first jig assembles the tops and bottoms of the ammunition boxes. The lid or punch member is hand actuated by the operation of toggle clamps, as shown, and the assembly is loosened for hand removal by a knockout bar, shown on the right. The four sides of the box are assembled on the second jig and angles glued to corners. The bottom is then placed on the jig, the jig is closed, clamped and pressure screws are turned forcing parts of the assembly to be pressed solidly to the heat box. The assembly is cured for 15 minutes and the completed ammunition box is removed.

In addition to the time saving, the facts that the assembly can be watched during curing and that the temperature control assures uniformity of glue after curing are also worth-while advantages. The process, a constant low temperature and a low pressure glue or resin setting operation, is applicable for assembling or fabricating of wood or other products that can be joined by a resinous or synthetic glue which must be heat cured.

Post Graduate Study Opportunities

The training department of the Allis-Chalmers Manufacturing Co., in cooperation with the Illinois Institute of Technology, has launcheda new post graduate educational course which will lead



The actual curing of the glue in the fully assembled box takes place in this "pop-up toaster" jig. The box is being placed in position. The box is then clamped for the operation of the heating cycle.

Atlas 10" LATHES

. . . Fundamental for peace as well as war . . .

The Atlas idea of "match the machine to the job"—so valuable in speeding war production—is also fundamental for keeping costs down in peacetime operations. As you make your post-war plans, keep in mind the many tools, dies, and small parts that can be handled by low cost, compact Atlas machines to prevent wasting the capacities of larger equipment. Send for latest catalogs. ATLAS PRESS CO., 1012 N. Pitcher St., Kalamazoo 13D, Mich.

to a Master of Science degree in electrical or mechanical engineering, according to Lee H. Hill, vice president in charge of industrial relations.

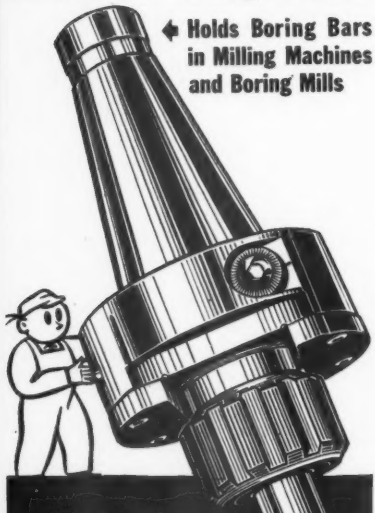
The graduate course of instruction, conducted after working hours for the Allis-Chalmers employees, will be taught at the West Allis plant by professors of the Illinois Institute of Technology.

Hill said the master of science degree will be granted to graduate engineers after the completion of 32 hours of approved curriculum, with a grade of "B" or better, and the writing of a satisfactory thesis. While the course will be open to any company employee with sufficient background to handle the studies, the post graduate degree will depend upon approval of undergraduate work.

Preliminary registration found approximately 60 signing up for the course, and it is expected more will register prior to the beginning of classes in October, Hill said.

ANNOUNCING! The new Universal Boring Chuck

← Holds Boring Bars in Milling Machines and Boring Mills



Holds boring bars rigidly. Offset adjusting screw allows bar to be advanced or receded to suit work. Anti-backlash arrangement insures extreme accuracy. Two sizes, for bars ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.

ARMY-NAVY "E" — Army Navy "E" Flag Two Stars

Fighter Plane Given by employees

20% — 20% Employees Bond deduction

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

An organization for postwar endeavors has been built by Herman A. Moe of East Greenwich, Rhode Island. Known as Research Associates, and successors to Moe Engineers, the organization is devoted to research, engineering and development of new machines and processes. The activities embraced cover the mechanical, electrical, electronics, hydraulic, plastics and chemical fields. The personnel includes prominent scientists connected with leading universities thus making available some of the finest laboratories for pure research work. To follow through on any project they have their own development machine shop manned by expert experimental machinists for the building of models of new machines and products.

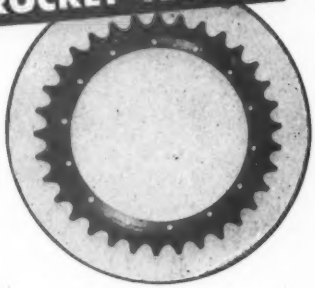
Postwar Research Facilities

General Electric's second largest plant at Schenectady, built two years ago for the manufacture of war equipment which is no longer required for the allied forces, is being converted for the production of jet propulsion aircraft turbines.

Jet Propulsion Plant

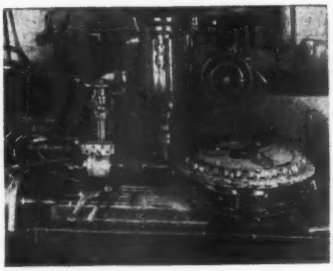
GE was chosen by the War Department to head up production of this new-type fighting weapon because of its more

CAN YOU *Equal* THIS SPEED IN MACHINING SPROCKET TEETH ?



33-Tooth Sprocket Machined in 31 Minutes With a Turchan!

Here's How It's Done!



This feat of the Turchan Follower, in roughing and finishing a 21⅞ diameter, 33-tooth sprocket of 1" steel (SAE 4140) in 31 minutes on a milling machine, clips 44 minutes off the time required to perform the same operation with gear cutters.

Equally amazing is the way the Turchan Follower cuts down the time of machining practically any part of irregular or eccentric shape on lathes, shapers, grinders, planers, and boring mills.

SEND US

Sample or Blueprint of Parts for Turchan Production Estimate

Speed Up Your Production Rate!

If you would like to know how much the Turchan will speed up the production rate on any part, send us the part or a blueprint for an estimate.

"Turn to Turchan"

TURCHAN FOLLOWER MACHINE CO.
8257 Livernois - Detroit 4, Mich.

TURCHAN
Hydraulic Follower Machine

than 40 years experience in the manufacture of steam turbines, and since World War I of the turbosupercharger, now used on practically all American bombing planes.

Even though an entire plant of 600,000 square feet of floor space is being converted for this work, output will be below government requirements, so G-E has turned over the jet propulsion drawings and specifications, prepared by its engineers, to another large corporation formerly engaged in the manufacture of airplane engines.

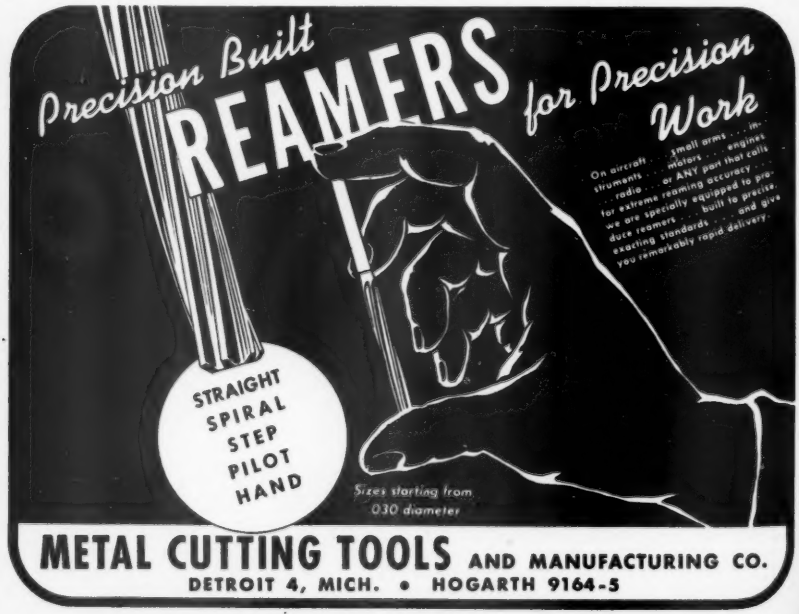
The first jet-propelled plane to fly in this country was equipped with a jet power plant manufactured by General Electric. However, the jet propulsion airplane turbine was first conceived by Flight Commander Frank Whittle and built by the British Thomson-Houston Company, Ltd., an associate of G-E, and was sent to this country for further development by G-E engineers. In this work, they were assisted by Mr. Whittle, who kept his identity concealed.

The jet propulsion principle is really an ingenious application of one of Newton's laws of motion which says that to every action there is an equal and opposite reaction. The jets of gas move in one direction; the inevitable reaction pushes the plane in the opposite direction. A common example is the rotary lawn sprinkler; it is whirled by jet propulsion.

In the substratosphere, where the air is very thin, the propellerless jet turbine works better than one with a propeller because the air resistance on the plane is less, and the jet power plant does not need air to push against. It doesn't push against anything that it does not provide itself.

F. Jerome Tone, Jr., Heads Carborundum Sales

Appointment of F. Jerome Tone, Jr., as vice president in charge of sales has been announced by President Arthur Batts of the Carborundum Company, Niagara Falls. He was previously vice president in charge of the Eastern sales division of the company. Mr. Tone succeeds Charles Knupfer, sen-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REAMERS
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On aircraft . . . small arms . . . instruments . . . motors . . . engines . . . radio . . . or ANY part that calls for extreme reaming accuracy . . . we are specially equipped to produce reamers . . . built to precise exacting standards . . . and give you remarkably rapid delivery.
STRAIGHT
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Sizes starting from .030 diameter
METAL CUTTING TOOLS AND MANUFACTURING CO.
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PEERLESS UTILITY FOR MISCELLANEOUS METAL SAWING!

THIS low-priced UTILITY Metal Cutting Saw sets new standards of value in power-driven metal sawing machines. It's made for wet or dry cutting—is motor or belt driven—capacity 4½" x 4½". Cutting stops automatically at end of cut or at any gauge-set point. Sensitive spring and cam type feed mechanism compensates for varying hardness of materials. Feed pressures are adjusted by hand screw. Heavy one-piece base and frame insures straight cutting and long life with sustained accuracy.

Why hack away by hand when you can save time, materials and manpower with the low-priced Peerless UTILITY?

Mail the coupon for Bulletin D.C. 54. If you're doing tool and die work you'll also want Bulletin 53 on the famous Peerless Vertical Metal Sawing Machine.

PEERLESS
MACHINE COMPANY
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Dept. TD-1044

☐ Rush Bulletin D.C. 54 on Peerless UTILITY Metal Cutting Saw. Also send following Peerless Bulletins:
☐ Bulletin MC-51 on new MECHANI-CUT Saw.
☐ Bulletin 53 on Peerless Vertical Saw.
☐ Bulletin HC-50 on Peerless Hydra-Cut.
☐ Bulletins on Stock Rests, Blades and Coolant.

Company .....
Name .....
Street Address .....
City ..... State .....

ior vice president, who has been assigned to special sales and executive duties.

"Jerry" Tone, as he is popularly called, is widely known in industrial circles and is president of the American Supply and Machinery Manufacturers' Association.

President Batts also announced that Vice President Henry P. Kirchner is to be in charge of production and Otis Hutchins has been named as technical director of the Carborundum Company in charge of research and process control and development.

A tentative uniform method of specifying alloy steels by hardenability to expedite wartime manufacture of weapons and armament and to conserve critical materials by facilitating selection and processing of steels on the basis of physical characteristics rather than chemical composition has been developed jointly by the Society of Automotive Engineers and the American Iron & Steel Institute.

Tentative Hardenability Specifications for 37 Steels Prepared Jointly by SAE and AISI

The hardenability data are presented in a booklet, "Tentative Hardenability Bands", prepared cooperatively by the Iron & Steel Division, SAE Standards Committee; Iron & Steel Committee, SAE War Engineering Board; and Technical Committee on Alloy Steels, AISI.

The uniform method is applicable currently to only 37 standard fine grain steels of modified chemistries for which tentative hardenability bands have been published. The steels, identified by customary SAE and AISI numbers, plus the code letter "H", include 4100H from .30 to .50 carbon inclusive; 4340H; 4620H; and the 8600H and 8700H series from .20 to .50 carbon inclusive.

For other standard steels minimum hardenability requirements consistent with minimum chemical compositions are being prepared. These will apply until sufficient SAE standard end-quench hardenability test data for full bands become available from studies now under way.

Center Scope Accuracy Solves Locating Problems!
It was used in making the initial setup of this job on a die sinking machine.
During the machining operations, the Center Scope was again used to check dimensions that were inaccessible to mechanical measuring instruments.
This illustration is but one of many examples of the use of the Center Scope in locating and measuring to a .0001" accuracy.
Send — today — for complete information. Just write Dept. C. S. 3 for complete details.
1000 PC
KEARNEY & TRECKER PRODUCTS CORPORATION
MILWAUKEE 14, WISCONSIN

Longer running time between replacements

To make machines run longer before requiring attention to centers — choose the center with the helical groove — made only by CMD. The exclusive advanced design, with the left-hand Helical Groove, assures more complete and longer lasting lubrication of point and work. No more burned-out center points! No stopping machine to relubricate center! No readjustments of tail stock! When CMD Helical Groove Centers are lubricated with CMD Center Point Oil, running time is frequently increased as much as 1500 per cent.

Write for* FREE *Sample Kit

CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 10J, 1928 West 46th St., Chicago 9, Ill.
Send circular on CMD Helical Groove Centers without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

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The new method, characterized as epochal and destined to become widely used by design engineers and in metal-working industries, springs from an engineering philosophy of selecting steels on the basis of hardenability as an index of tensile strength, with only corollary reference to chemical compositions, enunciated at SAE meetings for some years. Subsequent to an SAE symposium on hardenability held in 1941 at Detroit, the SAE Iron & Steel Division developed a "Recommended Practice on Method of Determining Hardenability", which was published in the SAE 1942 handbook.

When the long-recognized importance of tests for hardenability was emphasized the exigencies of war production and the widely fluctuating availabilities of various steels, the SAE War Engineering Board Iron & Steel Committee undertook cooperatively with AISI to collect and to analyze test data so as to establish hardenability bands for "National Emergency" and other wartime steels in larger demand. Later SAE and AISI undertook, through a joint committee, to increase the effort to obtain and to tabulate test data, to determine the hardenability ranges of various steels; and, by revision of SAE standard hardenability test procedures, to improve the correlation between the findings of user and steel-mill laboratories.

Tools and Tooling Priorities for Development Work

The extent to which priorities assistance provided by Preference Rating Order P-43 may be used to get tools and tooling needed to make experimental models is clarified in Interpretation 2 to P-43, issued by the War Production Board.

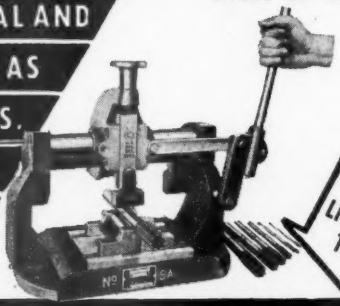
As used in the interpretation, "tools and tooling" means dies, molds, jigs, fixtures, patterns and other tools and equipment used in making experimental models of articles.

Tools and tooling for experimental models, the manufacture of which is permitted under existing WPB orders and regulations without taking advantage of Priorities Regulation 23 (Experimental Models), may be obtained through priorities assistance under P-43 regardless of whether the tools and tooling are operating supplies or capital additions.

For experimental models that cannot be made except through permission granted by PR-23, priorities assistance

THE ACROMARK No. 9A MACHINE
IS ESPECIALLY DESIGNED FOR
MARKING OF CYLINDRICAL AND
TUBULAR PARTS SUCH AS
TAPS, DRILLS, END MILLS,
MACHINE PRODUCTS, ETC.
WITH PERFECT RESULTS

A part is marked at each forward and each backward stroke of the lever



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Available in power driven units with new style clutch

ACROMARK
MARKING AND STAMPING SPECIALISTS
5-15 Morrell St., Elizabeth, N. J.

Most Versatile

Single Frame Hammer . . .

Designed especially for a wider range of work than the usual single frame forging hammer, the Chambersburg High Frame Hammer is proving itself a most versatile tool in many shops.

Because of its high frame, and greater working space, it is now possible to forge large discs and rings, to upset high stems, form arch bars, etc., on the most economical size of tool. Long punching with drifts is also facilitated.

Another important feature is undeviating alignment, which is preserved by the guides being supported on 5 sides, and by the tie-bar across the frames.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

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under P-23 may be used for getting needed tools and tooling only if they are charged as operating supplies. If they are capital additions, priorities must be obtained by the standard procedures for getting tools and tooling, WPB explained.

The question of whether a particular tool or tooling item would be a capital addition is determined by the manufacturer's established accounting practice, according to the interpretation. "It would, of course, be improper for a person to change his established accounting practice for the purpose of enabling himself to use the P-43 priorities assistance", the interpretation stresses.

The cost of any tools and tooling for experimental models that could not be made except for PR-23 must be included in determining the cost of the models, WPB pointed out. PR-23 allows a person to make such models costing in the aggregate not more than $5,000 a month in a single plant. If the cost is more than $5,000 a month for all such models of all products, application for authorization must be made to WPB field offices (WPB Form 3879).

Under P-43, only AA-3 ratings are given for tools and tooling for making experimental models of products designed primarily for civilian markets. AA-2 ratings and AA-1 ratings (in the case of serially numbered laboratories) are granted to get tools and tooling for experimental models of products for military use.

A person who is permitted to use P-43 priorities to get tools and tooling for experimental models may also use the priorities to get materials needed to make the tools and tooling himself, the interpretation states.

Death of Dr. Tone, Carborundum Board Chairman

The recent death of Dr. Frank Jerome Tone, Chairman of the Board of the Carborundum Company, recorded the passing of one of the truly great figures in the world of electrochemistry and electrometallurgy.

Dr. Tone was one of the pioneers in both of these fields of science and his many contributions to industry will long be regarded as memorials to a great career.

CRITERION *Boring Heads*

Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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To a minute in a minute

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● **The Bemisine speeds up and simplifies setting any angle from 0 to 90°—using only a 2" Micrometer*! *It holds the work! Faster than a Sine Bar or Protractor! A Jig Eliminator on Surface Grinders and Jig Borers!***

**Also used with standard gage blocks.*

SEND FOR Bulletin describing this new solution for an old Problem!

NICHOLS-MORRIS CORPORATION

50 CHURCH STREET NEW YORK 7 N Y

One of the rare men in industry, Dr. Tone had the combined attributes of an outstanding scientist, inventor, a skilled engineer, a keen business man, and a far-sighted executive. He was an authority on patents—and his reputation as a scientist was world-wide, winning him many honors during nearly half a century of his achievements.

He was graduated from Cornell in 1891 with a degree in Mechanical Engineering and for four years was employed as an engineer with eastern power companies. In 1895, he became associated with Dr. Edward Goodrich Acheson, creator of the first man-made abrasive known to industry as Carborundum, and moved with him as plant engineer to Niagara Falls—taking advantage of the great power development there.

It was here that Dr. Tone's brilliant career in research experiment and development began and grew. He and his associate, F. A. J. Fitzgerald, were the first to apply a thousand horse-power to an electrothermic process and, in the then little plant, they were soon utilizing about half the entire output of Niagara Falls power in the manufacture of the abrasive silicon carbide or Carborundum.

His work in the abrasive field is considered as a large factor in revolutionizing the abrasive industry. His achievements included an intensive study of the properties of abrasives and the processing and development of grinding wheels and other abrasive products widely used in industry. His genius led him into many other fields and the development of many other electric furnace products. Notably was his pioneer work in the development of super refractories.

He was granted over 150 patents; many honors were conferred upon him, and he was a member of many scientific societies and clubs. In 1919, Dr. Tone was elected President of the Carborundum Company and in April, 1942, was named Chairman of the Board.

A SERIES OF BULLETINS describing G & L floor type and table type, high power, precision, horizontal boring, drilling and milling machines, their accessories and attachments, have been issued by the GIDDINGS & LEWIS MACHINE TOOL CO., Dept. TJ, Fond du Lac, Wis.

DON'T GUESS...

Be Accurate with ACME DRILL JIG BUSHINGS

There's no guesswork when your jigs are equipped with Acme Bushings. On the contrary, accurate drilling is assured, because drill jig bushings from Acme are produced by specialists in precision manufacture.

Acme offers two complete bushing standards, the A.S.A., *plus* the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.

You are invited to write for details on Acme's complete line of products and services offered to the precision working field.

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Makers of Standardized Jig and Fixture Bushings

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WHEN IT'S *Versatility* YOU WANT!

●Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 625 So. California Ave., Chicago, Ill.

HASKINS
Flexible Shaft
EQUIPMENT
More VERSATILE Machines for More PROFITABLE Work

Weld with

Phillips "Crucible-Arc"

Special Purpose Welding Electrodes

TO CUT PRODUCTION COSTS AND PLUG PROFIT LEAKS

There is no magic or mystery about the materials or procedures on the special jobs for which PHILLIPS CRUCIBLE-ARC Electrodes are recommended. The single basic principle is that welding is done with heat. The right electrode applied with the proper control of heat will produce the desired properties in the deposit—not sometimes but always. The correct procedures are easily mastered.

IN FOUNDRIES

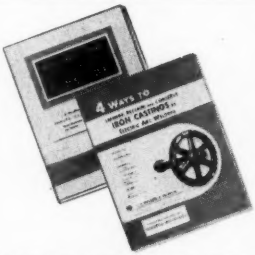
Quick, inexpensive repairs to defective gray iron castings reduce scrap losses and increase net production. Minor mistakes in design are corrected. Changes in design are effected without repouring. Arc weld deposits on gray iron castings are machinable through the line of fusion when made with PHILLIPS "600" Electrode.

IN MACHINE SHOPS

When defects in iron castings are discovered after machining is started, they are corrected by arc welding. Your investment in set-up and machining time is protected. You save the delays caused by waiting for replacement castings to arrive. Mistakes in machining are corrected by the same procedure.

IN TOOL AND DIE ROOMS

Many tools and dies are fabricated at low cost by arc welding machine steel parts and then depositing the proper type of alloy steel at the required points. Worn and damaged dies are restored to service. Design changes are made on short notice. "CRUCIBLE-ARC" Electrodes are available for water-, oil-, and air-hardening steels.



THESE NEW WELDING MANUALS ARE *FREE*

4 Ways to Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding

Tells how to select electrode material for various job requirements, and gives full details of procedures to use for best results with each material.

Arc Welding in the Maintenance and Construction of Tools and Dies

Explains the theory, outlines procedures and furnishes the engineering data which you need for successful welding in the tool and die shop.

Either one or both of these valuable books will be sent promptly on request, and without obligation.

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"ROTARY FILES WAR SUPPLEMENT"—This attractive 6-page folder with a 4-page insert recently published by the GROBET FILE CO. OF AMERICA, Dept. TD, 421 Canal St., New York 13, N. Y., illustrates, describes and prices over 72 rotary files of various shapes, both hand cut and ground from the solid, while the insert appendix shows profile drawings of the different styles. The supplement lists the different sizes in which each style

may be had, giving the diameter and length of cut of each. Many of the files are offered with a choice of Double Extra Coarse, Extra Coarse, Coarse, Medium, Fine or Smooth cut. Complete sets of diesinkers' rotary files are included in the folder. Hand cut Rotary files are recommended for filing steel and hard metals. Ground from the solid these files are recommended for filing aluminum, magnesium and soft metal.
INFORM-A-GRAM KEY No. 705-Q

CEMENTED CARBIDE TOOLS, BLANKS & SPECIALTIES are well presented in Catalog 44 recently published by KENNAMETAL, INC., Dept. T, Latrobe, Pa. Kennametal tools of standard design are shown in a wide range of styles and sizes for the machining operations of turning, boring, facing, tangent cutting in roller-turners, parting and grooving. Each style of tool with its typical application is illustrated. Complete specifications and prices are given, to permit ready selection and ordering by catalog number.
INFORM-A-GRAM KEY No. 33-Q

ROTOREX PRECISION TAPPER is described in a 4-page illustrated pamphlet issued by DOUGLAS MACHINERY CO., INC., Dept. TD, 148 Broadway, New York 7, N. Y. This new Precision Tapping Attachment is unique in that it provides controlled, positive lead, tapping and an automatic cycle in a low priced attachment which may be readily installed without any alteration to the standard 17" Delta Drill Press. The controlled lead principle makes it possible for unskilled operators to consistently produce Class 3 or better threads.
INFORM-A-GRAM KEY No. 586-Q

V-BLOCK FIXTURE which saves time on milling, boring and inspection set-ups is illustrated in Bulletin VB-103 available from the HARTFORD SPECIAL MACHINERY CO., Dept. D, 281 Homestead Ave., Hartford 5, Conn. This fixture provides a practical and convenient method for locating and holding a wide variety of irregularly shaped work and incorporates a semi-steel base accurately machined and scraped.
INFORM-A-GRAM KEY No. 575-Q

WESSON UNIVERSAL VISE—A precision machine tool vise for angular milling, grinding and drilling is described in an illustrated circular issued by WESSON PRODUCTS CO., Dept. TJ, 710 Fisher Bldg., Detroit 2, Mich. This vise, which saves setup time on all angular operations and insures accurate angles, has an original "cradle" design that provides greater rigidity. This portable vise may be easily moved from one machine to another without removing the work.
INFORM-A-GRAM KEY No. 710-Q

UNIVERSAL TAPPING MACHINES for small sensitive high-speed tapping are illustrated in Bulletin 112 issued by the PROCUNIER SAFETY CHUCK CO., Dept. J, 12-14 S. Clinton St., Chicago 6, Ill. Tap feeding and reversing pressures are pre-set and adjustable to meet the exact requirements of the tapping job—independent of operator. Two long spiral compensating springs, between foot mechanism and tap, maintain pre-set pressures on tap regardless of pressure applied to foot pedal. This feature automatically indicates when taps become dull or loaded, since the correct pressure for driving a sharp tap will not drive a dull one.
INFORM-A-GRAM KEY No. 623-Q

ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

Complete with motor and saw attachment at

$125.00

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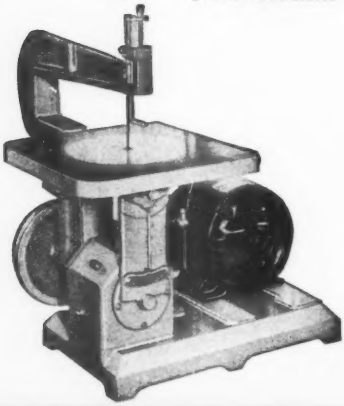

Milwaukee Chaplet and Mfg. Co.
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ALTITUDE CHAMBERS which show how products and materials will react and perform at any given altitude, temperature and degree of humidity are described in Bulletin AC441 recently issued by the KOLD-HOLD MFG. CO., Dept. T, 445 N. Grand Ave., Lansing 4, Mich. Everything which goes into an airplane can be tested under conditions more severe than will ever be encountered in actual fight. No matter where materials or products are to be flown, in the frozen arctic or over a sweltering jungle, it is now possible to know for certain, just what the performance will be.
INFORM-A-GRAM KEY No. 84-Q

COLLETS AND CHUCKS are illustrated in Bulletin 100-C published by RIVETT LATHE & GRINDER, INC., Dept. D, Brighton 35, Mass. Lathes, milling machines and other tools can readily be equipped to use draw-in collets and step chucks. A collet adaptor and draw-bar with handwheel are the only additional parts needed. This convenient method of chucking reduces time and increases precision on toolroom and production work.
INFORM-A-GRAM KEY No. 655-Q

MILWAUKEE FACE MILL GRINDER designed for Tungsten Carbide Cutters is illustrated in Bulletin 41A issued by KEARNEY & TRECKER PRODUCTS CORP., Dept. TJ, Milwaukee, Wis. This heavy duty machine incorporates every needed feature for properly sharpening face mill cutters. Its unique features make possible faster cutting, more accurate work, better finishes, longer cutter life, as well as the sharpening of cutters made of other materials.
INFORM-A-GRAM KEY No. 592-Q

HAMMERS AND MALLETS are fully described in a complete catalog published by the CHICAGO RAWHIDE MANUFACTURING CO., Dept. TJ, 1280 Elston Ave., Chicago, Ill. These Rawhide tools strike forceful controlled blows without breaking, injuring or marring finished surfaces, machine parts, tools or products. Illustrated descriptions of Rawhide Gears and Pinions are presented along with Couplings, Polishing Wheels and Valve Discs, Washers and Gaskets, and Rawhide Oil Seals. Available in a wide range of sizes, easily and simply installed, Rawhide unit type seals are adaptable to all types of reciprocating or rotating shafts.
INFORM-A-GRAM KEY No. 643-Q

SUNNEN PRECISION HONING MACHINE No. MA-1290 with base, coolant pump and belt guard is described and illustrated in a

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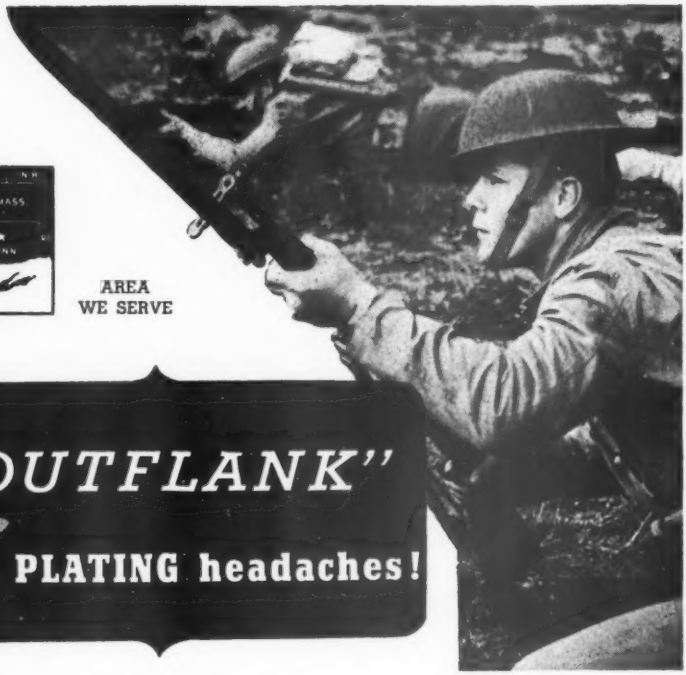

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How is your wartime strategy these days?

Would you like to "*outflank*" some of your plating headaches—for an unconditional surrender, once and for all?

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There's a strong supporting force, ready to help you in Hartford, Connecticut. The name of the outfit is Hartford Chrome. They have blitzkrieged chrome plating problems for hundreds of leading manufacturers in the East. They're never too late, with too little — always enough, and on time!

Throughout the war, they have added to their strength—increased their "fire-power"—and they can serve you promptly on production jobs, salvaging parts, or any hard chrome plate requirement.

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complete set of literature issued by SUNNEN PRODUCTS CO., Dept. TJ, 7947 Manchester Ave., St. Louis 17, Mo. Sunnen Portable Hones are precision tools that provide an economical means of accurately finishing bores from 2" to 14½" diameter. They are ideal for correcting errors (within .0003" to .0005" with a minimum of stock removal) of taper and out-of-roundness from previous machine operation.
INFORM-A-GRAM KEY No. 583-Q

ROUSE HAND MILLER and companion line of Fixtures Set-Ups are illustrated in circulars available from H. B. ROUSE & CO., Dept. TJ, 2214 N. Wayne Ave., Chicago 14, Ill. A high-speed, ball bearing, motor driven machine made for handling light cuts in brass, aluminum, and similar materials, this Miller is used extensively in airplane plants, on instruments, and ordnance parts. It can be used in finishing small parts for radios, electric motors, communication equipment ,and similar work.
INFORM-A-GRAM KEY No. 106-Q

TAP RECONDITIONER on which all operations necessary for keeping taps in "top" condition can be quickly and accurately performed is described in a 4-page Bulletin, No. DTR-3, just released by DETROIT TAP & TOOL CO., Dept. TJ, 8432 Butler Ave., Detroit 11, Mich., manufacturers of standard and special taps, thread gages, precision tapping machines, etc. This new tap reconditioner has been made into a "4-in-1" machine by adding to the machine's original functions of chamfering, spiral pointing, and spiral point polishing, facilities for sharpening the entire tap by grinding the full length of its flutes. Instructions for carrying out these four operations are given.
INFORM-A-GRAM KEY No. 134-Q

DEEPFREEZE INDUSTRIAL CHILLING EQUIPMENT is fully described in a 24-page illustrated booklet published by the Deepfreeze Div., MOTOR PRODUCTS CORP., Dept. TJ, 2307 Davis St., N. Chicago, Ill. The new Deepfreeze principle of refrigeration makes it possible to reach temperatures as low as −120° F and the equipment has the capacity to remove 1000 B.T.U.'s per hour at that temperature. This rapid rate of heat absorption provides faster shrinking, testing and treating of metals at considerable savings over other methods.
INFORM-A-GRAM KEY No. 404-Q

DIE MAKING MACHINES which are extremely fast and accurate on all sawing, filing and lapping operations are described in a 12-page brochure issued by OLIVER INSTRUMENT CO., Dept. DJ, 1436 Maumee St., Adrian, Mich. Their Heavy Duty Die Making Machine is equipped with every useful device for the

Rawhide PROTECTS

The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring . . . protects finished surfaces, machines delicate insulation and parts. Speed die-setting, assembly, no fatiguing re-coil, Reduce breakage and spoilage. Sizes

C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.

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VERSATILITY

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WEBBER GAGE BLOCKS

● Webber Precision Gage Blocks are performing an important service in maintaining dependable accuracy in tool rooms—in tool and die shops—in mass production plants.

Webber Gage Block Sets are more versatile — They offer about twice the normal range of measurements due to the .10005" block which permits measurements in steps of one half of one ten thousandth of an inch instead of the usual .0001". This block is included in all Webber No. 84-A sets.

Webber Blocks maintain accuracy longer. There are two reasons for this—first all tolerances are kept on the plus side in making the blocks. For example "A" sets have tolerance of .000004" or less and this is always a plus tolerance. Second—there are two .100" "wear" blocks with every No. 84-A set. These are used to contact the work — save wear on original blocks — maintain desired precision over longer periods.

Thus Webber Gage Blocks offer greater versatility by doubling the range—have increased the life of the set with the two wear blocks—provide greater economy in making precision measurements from the tool room to the assembly line.

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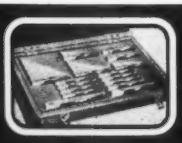
Webber's service includes every facility for inspecting—reconditioning and replacing worn or damaged blocks at a moderate cost.

Prompt delivery is available on the following Webber Gage Blocks—

Set No. 84A		$350.00
Set No. 84B		$235.00
Set No. 43A		$185.00
Set No. 43B		$150.00
Set No. 38A	(Thin Blocks)	$195.00
Set No. 38B	(Thin Blocks)	$155.00
Set No. 14A	(Angle Blocks)	$450.00



Webber GAGE COMPANY

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rapid production of dies and similar tools. It has capacity for sawing or filing in metals up to 3" in thickness and filing still heavier materials with a shorter stroke. Any type of parallel files or any size of saw from the smallest to the heavier machine saws can be held in the clamps without any previous preparation.
INFORM-A-GRAM KEY No. 697-Q

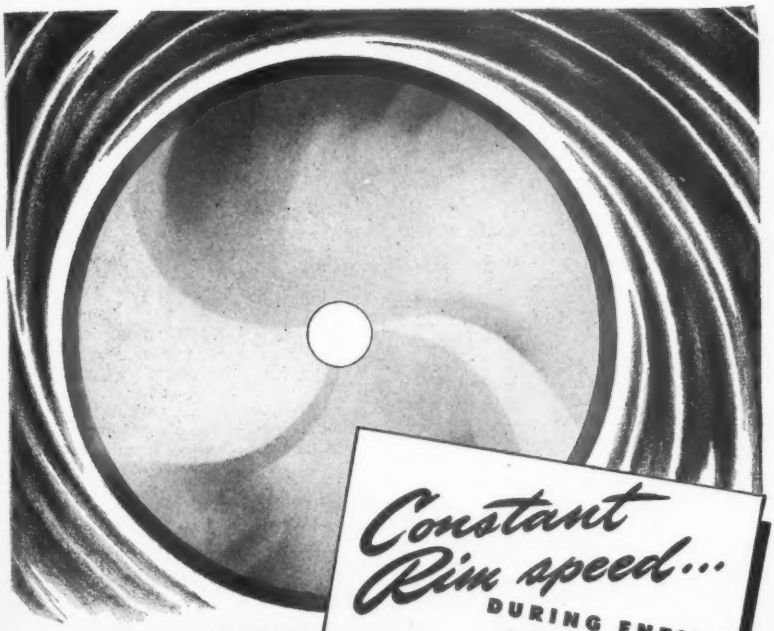
HYDRAULIC FEED SURFACE GRINDERS are detailed in Bulletin GL-100 recently published by the GALLMEYER & LIVINGSTON CO., Dept. J, 304 Straight Ave., SW, Grand Rapids 4, Mich. Several of the wheel trueing devices which can be furnished with these machines are illustrated. All Grand Rapids Hydraulic Feed Surface Grinders described are equipped with one-shot lubricating system by means of which one pressure on a conveniently placed lever oils all bearings and working surfaces except spindle and motor bearings. This insures long life, freedom from trouble, and practically eliminates oiling time.
INFORM-A-GRAM KEY No. 625-Q

HYDRA-CUT HYDRAULIC SAWS are featured in Bulletin HC-50 released by the PEERLESS MACHINE CO., Dept. T, 1600 Junction Ave., Racine, Wis. Their four sided saw frame with backing plate was designed to locate bearings above and below the saw blade to insure rigidity and prevent run-out. These machines are built in three popular sizes to take the widest range of standard bars, billets, tubes and structural shapes. The 7" and 11" Hydra-Cut machines are convertible in the field for multiple-bar, automatic cutting. Both manually operated and automatic conveyors are available. All accessories required to convert the Hydra-Cut for multiple-bar, automatic sawing are described and illustrated.
INFORM-A-GRAM KEY No. 680-Q

CARBIDE TIPPED CUTTERS for milling are featured in a 4-page leaflet issued by SUPER TOOL CO., Dept. D, 21650 Hoover Rd., Detroit 13, Mich. Complete details, specifications and prices of both general purpose cutters for milling in cast iron, non-ferrous and other materials and cutters designed specifically for carbide tipped milling in steel are given.
INFORM-A-GRAM KEY No. 168-Q

AIR CYLINDERS for more efficiency in pneumatic power movement are featured in Catalog 43 issued by the TOMKINS-JOHNSON CO., Dept. T, 617 N. Mechanic St., Jackson, Mich. These T-J Air Cylinder Bores and Piston Rods are hard chromium plated against rust and wear. Cylinders may be furnished cushioned at both ends or at either end. Information on how to select the size cylinder required is given.
INFORM-A-GRAM KEY No. 151-Q

AMES No. 22 DIAL TEST INDICATOR
An ideal testing outfit for machinists, tool-makers, inspectors, scrapers and assemblers. Handy for determining the flatness of surfaces, roundness and trueness of revolving parts, relative heights and thicknesses, etc. Adjustable to any position, nicely proportioned for easy handling, sturdily built to support the Indicator rigidly, and nicely finished.
Packed in deluxe wooden box. Other models shown in our catalog. Send for a copy.
B. C. AMES CO.
WALTHAM, MASS., U. S. A.



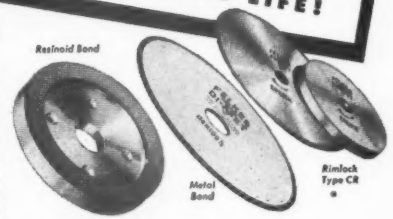
DI-MET
DIAMOND WHEELS

DI-MET Diamond Wheels give you fast cutting, efficient service on all grinding and cutting-off operations where use of diamond wheels are practical* because *rim speeds show negligible change during entire wheel life* . grinders with fixed spindle speeds, therefore, maintain their full efficiency from the time the wheel goes on the machine until its long, useful life is ended.

This slow-wearing rim has other advantages too—it makes precision easier to maintain from end to end on cylindrical or surface grinding. It simplifies obtaining uniform dimensions on multiple-toothed cutters without time wasted for individually indicating cutter teeth or for making constant machine infeed adjustments to compensate for wheel wear.

DI-MET Diamond Wheels lower down time for tool maintenance, cut fast and free, will not craze fragile carbide surfaces, produce much keener cutting edges than ordinary abrasives. Our catalog shows prices and sizes of all standard DI-MET wheel types—write for your free copy without delay!

FELKER MANUFACTURING CO.
1111 BORDER AVENUE, TORRANCE, CALIFORNIA



* **DI-MET DIAMOND WHEELS ARE MADE IN 3 BONDS:**

RESINOID BOND—for rapid grinding and cutting-off on all types of sintered carbides.

METAL BOND—for grinding all types of sintered carbides and non-metallic materials with exceptionally long wheel life and ability to hold rim shape.

RIMLOCK & TYPE CR—for cutting off grooving and milling non-metallic materials such as glass, porcelain, quartz, clay products, vitrified materials, asbestos-cement, concrete, other similar substances.

FELKER DI-MET

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

PILOT GAGES are presented in an illustrated pamphlet issued by the PIPE MACHINERY CO., Dept. J, 930 E. 70th St., Cleveland 8, Ohio. The purpose of the Pilot feature is to make gage applications easier and quicker in tight or blind holes. This feature protects the gage from rapid wear at the nose end, and the gage itself lasts longer, with maintained accuracy. Any standard or special cylindrical plug gage can be supplied with the Pilot feature—taper or tri-lock gages, regular, progressive or extra length gaging members.
INFORM-A-GRAM KEY No. 660-Q

WALKER-TURNER MACHINE TOOLS are featured in Catalog No. G-3-R published by the WALKER-TURNER CO., INC., Dept. TD, Plainfield, N. J. The Walker-Turner 20" Drill Presses are made primarily for fast production drilling operations. Their unusually wide speed ranges make it practical to drill all varieties of material. They are the largest of the several sizes made by this company. Among the typical installations illustrated is that of a precision drilling operation being performed by women operators.
INFORM-A-GRAM KEY No. 512-Q

PORTABLE FLEXIBLE SHAFT MACHINES are illustrated and described in Catalog 45 recently issued by R. G. HASKINS CO., Dept. D, 625 S. California Ave., Chicago 12, Ill. Some of the more common operations best performed with a flexible shaft machine include grinding, drum and disc sanding, filing, wire brushing, buffing and polishing. Typical jobs are illustrated. These versatile tools are recommended for finishing operations, delivering constant power, and removing surplus material.
INFORM-A-GRAM KEY No. A70-Q

METAL CUTTING BAND SAW MACHINES especially desirable for foundries, pattern shops, die shops and sheet metal shops are featured in an illustrated circular issued by the WELLS MFG. CORP., Dept. J, 1940 Ash St., Three Rivers, Mich. These heavy, sturdily constructed saws have variable controlled feeds for each type of cutting job. Their simplicity of design makes them ideal for production and maintenance cutting.
INFORM-A-GRAM KEY No. 156-Q

COLLETS & FEED FINGERS and other automatic and hand screw machine accessories are featured in Catalog 15 published by the SUTTON TOOL CO., Dept. J, Sturgis 2, Mich. Line drawings depict the superiority of diamond serrations over conventional rectangular serrations. Diamond serrations attack horizontal and rotating thrusts at an angle. The Sutton Style "M" Master Feed Finger with mechanically controlled tension has been designed for quick adjustment of the tension of

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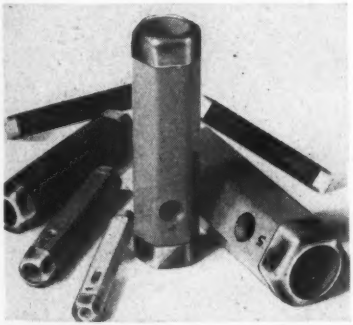
FEDERAL

Taperlock Plastic

GAGE HANDLES

Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles the danger of chipping and breaking is greatly reduced.

Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.

Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.

IMMEDIATE DELIVERY
On Rated Orders

FEDERAL TOOL CORPORATION

400 NORTH LEAVITT STREET **CHICAGO 12, ILLINOIS**

the stock without removing the feeder from the machine. It also permits the grip to be renewed many times after it has become worn away from long use.
INFORM-A-GRAM KEY No. 482-Q

PULL-UP BROACHING MACHINES are described in a comprehensively illustrated 16-page Bulletin, VDS-44, just released by COLONIAL BROACH CO., Dept. TD, P. O. Box 37, Harper Station, Detroit 13, Mich., manufacturers of ground HSS broaches, broaching machines, broach sharpeners and fixtures. The evolution of the modern vertical type of Pull-up broaching machine and its advantages —such as providing high production capacity while reducing floor space requirements—are discussed. Primarily, these Pull-up machines are used for the internal broaching of rounds, splines, squares, gear teeth, etc.
INFORM-A-GRAM KEY No. 26-Q

CARBIDE TOOLS—Standard and Special tools and parts including burnishing nests, guide bushings and collets are described in literature available from the NEW ENGLAND CARBIDE TOOL CO., INC., Dept. D, 60 Brookline St., Cambridge 39, Mass. Burnishing nests can be furnished in solid form, or with a carbide ring brazed to a steel insert with any specified hole size. New England collets are designed for use in Swiss-type automatic screw machines, and can be supplied with hole diameter from $\frac{1}{64}$" to ½" inclusive, in steps of $\frac{1}{64}$".
INFORM-A-GRAM KEY No. 58-Q

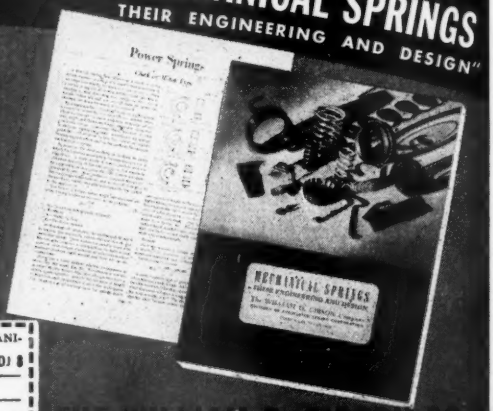
BESLY TITAN STEELBAC DISCS are illustrated in a 20-page booklet published by CHARLES H. BESLY & CO., Dept. J, 118 N. Clinton St., Chicago 6, Ill. The Steelbac eliminates the work of sulphuring into mounts or the setting out of wheels held in chucks. They possess that cool, free cutting quality and the use of Resinoid Bond, unaffected by the coolant, gives a long lived wheel.
INFORM-A-GRAM KEY No. 915-Q

STANDARD ELECTRIC TOOLS including grinders, buffers, blowers, drills and speed lathes are described and illustrated in Catalog 43 issued by the STANDARD ELECTRICAL TOOL CO., Dept. TJ, 2488-96 River Rd., Cincinnati 4, Ohio. Their Tool Post or Center Grinders are particularly adapted for grinding lathe centers, cutters, reamers, dies, rolls and various work on lathes, milling machines, shapers, planers or boring mills. The Standard Vertical Spindle Grinders provide for heavy thrust grinding and are primarily intended for mounting vertically on Planers or Boring Mills.
INFORM-A-GRAM KEY No. 470-Q

GEAR FINISHER FOR SPUR & HELICAL GEARS—Their complete line of improved Model 860-A gear finishing machines, operat-

Helpful New Engineering Handbook

"MECHANICAL SPRINGS
THEIR ENGINEERING AND DESIGN"



Combines the engineering knowledge and research results of 7 associated producers of quality springs. Profusely illustrated. Shows tables, graphs; gives spring design formulas; indicates types of springs and spring materials best for various applications. Sent on request to executives.

GIBSON-SPRINGS

GENTLEMEN:—Please send me copy of "MECHANICAL SPRINGS—Their Engineering and Design."
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THE WILLIAM D. GIBSON CO.

Are You Ready

TO GET FASTER • MORE ACCURATE ANGULAR SET-UPS

after V Day?

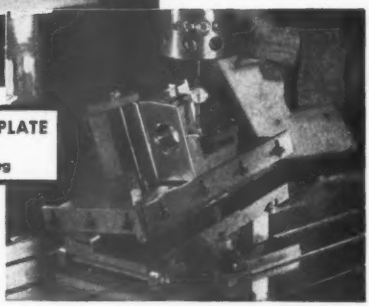
The MAGNA-SINE
For Angular Grinding

Magna-Sines and Robbins Sine Plates can be extremely useful in speeding up angular machining operations in reconversion to peacetime production.

The Magna-Sine, employing the gage block method of securing angles, provides the fastest, most accurate way to secure single and compound angular grinding set-ups. Parts are held firmly but without distortion at the turn of a switch.

The Robbins Sine Plate is a non-magnetic counterpart of the Magna-Sine. Built with the same care and to the same close limits as the Magna-Sine, it has proved invaluable for angular inspection and angular jig boring.

The ROBBINS SINE PLATE
for
Angular Inspection



The ROBBINS SINE PLATE
for
Angular Jig Boring

★

FAST DELIVERIES CAN NOW BE PROMISED

ROBBINS ENGINEERING COMPANY

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ing on the "Michigan" crossed-axis gear shaving principle, are described in technical Bulletin 860A44 now available from MICHIGAN TOOL CO., Dept. T, 7171 E. McNichols Rd., Detroit 12, Mich. The 860-A is built in three different sizes, designed to finish gears up to maximum diameters of 8", 12" and 18". Gears or splines as small as 1" OD may be shaved on any of the three sizes, and all three types will finish gears up to 5" in width. A discussion of the principles of crossed-axis gear cutting is also included.
INFORM-A-GRAM KEY No. 47-Q

STANDARD TUNGSTEN CARBIDE TOOL BLANKS available from stock of the TUNGSTEN CARBIDE TOOL CO., Dept. J, 2661 Joy Rd., Detroit 6, Mich., are listed in Bulletin 44-2 issued by the company. A total of some 640 types, sizes and grades of standard tips are given. Also included is a ready reference table permitting selection of the correct grade of Carboloy cemented carbide for the specific application to which the tool is to be put, five different grades of Carboloy being available from stock.
INFORM-A-GRAM KEY No. 887-Q

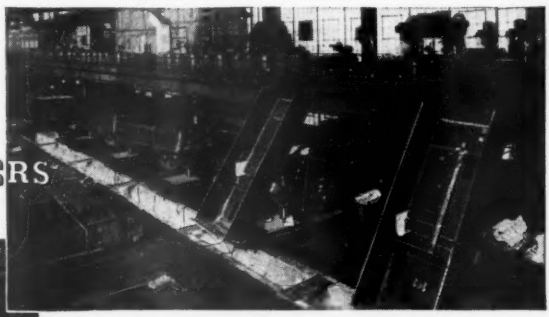
VARIABLE VOLUME HYDRAULIC PUMPS & VALVES are pictorially described in Catalog P-10-C recently published by RACINE TOOL & MACHINE CO., Dept. J, Racine, Wis. The variable volume principle offers great economies in reducing horse power consumption, elimination of by pass valves, relief valves, etc., and lessens oil heating as compared to constant volume pumps. The various types of Racine Pumps and their modifications are described in detail along with simplified circuit drawings which illustrate the principal application of standard units.
INFORM-A-GRAM KEY No. 644-Q

THREADWELL TAP BOOK, written for the man whose job it is to cut internal threads in metals or plastics, has been published by the THREADWELL TAP & DIE CO., Dept. TJ, Greenfield, Mass. A guide to tapping various materials is included along with decimal equivalent tables. Steps in the development of modern screw threads are given and the various kinds of taps are pictorially described.
INFORM-A-GRAM KEY No. 70-Q

INFORMATION ON POSITION WELDING and a description of the complete Ransome line of Welding Positioning equipment is featured in a 40-page, two-color bulletin, No. 2148, released by RANSOME MACHINERY CO., Dept. TD, Dunellen, N. J., a subsidiary of Worthington Pump and Machinery Corp. The many advantages of proper positioning for welding are treated and the use of positioning equipment is explained and illustrated. The complete range of Ransome Positioners from a small hand-operated unit to the 40,000 lb.

C-F

POSITIONERS



"POSITION" COUNTS MOST IN THIS HEAVY WELDING OPERATION

●Production welding usually means working on top, bottom and on all sides of the weldment. It means a "quick change" of position should be possible for greater time saving, more efficiency, lower costs and greater safety to men and materials. With C-F positioners a welder can quickly position even the most cumbersome weldments at the press of a button, without crane help or handling crews. With just one set-up of the weldment he can position it easily, speedily and safely, all alone. He can rotate it a full 360° at variable speeds from 0 rpm up, tilt it to 135° beyond horizontal, and can weld, down-hand, all sides, surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance and all are adjustable for height.

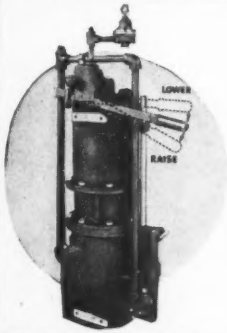
Write for Bulletin WP-22

CULLEN-FRIESTEDT COMPANY

1316 S. Kilbourn Ave. Chicago 23, Ill.

Versatile KRW PRESSES speed shell production

KRW Presses speed shell loading in one of the nation's largest arsenals.



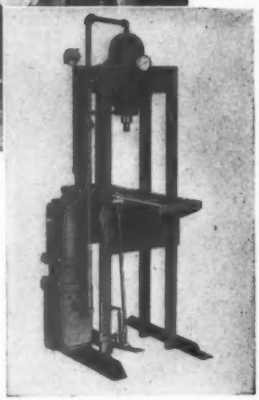
THE KRW SPEEDI-BOOSTER

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

Equipped with KRW Speedi-Booster, they have helped our Armed Forces get Enough and On Time

● When the history of America's Victory in this war is written, one of the most important chapter headings will read—MACHINES. One versatile machine, which was quickly adapted to war production, was the KRW Hydraulic Arbor Press. In many an arsenal, it has put the "fight" or powder in untold millions of shells of many types and calibers.

In literally hundreds of other widely varied manufacturing operations, basically similar KRW Presses have reduced costs. Using air pressure varying from 100 to 225 lbs., the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke — important on many operations.



KRW Hydraulic Presses are available in either standard form or specially built to handle a particular operation, for both vertical and horizontal action. We also manufacture suitable air compressors. Write for our Hydraulic Arbor Press Bulletin.

K. R. WILSON
10 LOCK ST. BUFFALO 2, N. Y.

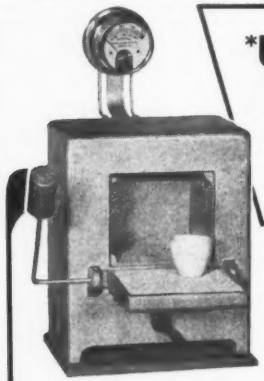
heavy-duty machine are shown, as are Turning Rolls and Headstock-Tailstock combinations. Dimensions, load capacities and complete specifications on each model are included.
INFORM-A-GRAM KEY No. 437-Q

ABRASIVE CUTTING MACHINES are highlighted in a 4-page folder recently released by the Andrew C. Campbell Div., AMERICAN CHAIN & CABLE CO., INC., Dept. TJ, Bridgeport, Conn. Important specifications for each machine in addition to illustrations and descriptions are included. A good range of Campbell machines are shown so that the men who have cutting problems can examine the most popular machines and find out which one is best suited for their job. Shown on the back page are Campbell Nibbling Machines, including the most recent Model No. 250.
INFORM-A-GRAM KEY No. 185-Q

FARQUHAR HYDRAULIC PRESSES are profusely illustrated in an 8-page folder available from the A. B. FARQUHAR CO., LTD., Dept. TD, Hydraulic Press Div., York, Pa. The complete range of types, sizes and capacities available to industry are shown. These presses afford the operator complete control of the slide speed at all times, allowing proper dwell time to keep products conformed to dies. They have semi-automatic control—and manual control for die setting. Their self-contained features increase production and reduce the possibility of rejects and repressings.
INFORM-A-GRAM KEY No. 288-Q

SPEEDAIRE REDUCTION DRIVE UNITS are detailed by means of cutaway photographs, charts, diagrams and engineering tables in Catalog 300 issued by the CLEVELAND WORM & GEAR CO., Dept. DJ, 3301 E. 80th St., Cleveland 4, Ohio. With Speedaire, heat generated during the operation of the unit passes through the oil bath to the deeply-finned wall of the reservoir. An exhaust fan on the coupling end draws a continuous stream of air at high velocity between the double walls that form the lower half of the unit, completely scouring the surface and providing an effectual transfer of heat. The catalog states that as the result of this improved cooling, smaller sizes of Speedaire fan cooled worm gear reduction units may be applied to a given installation than have been possible heretofore.
INFORM-A-GRAM KEY No. 777-Q

FRACTIONAL HORSEPOWER DRIVE INFORMATION—Their complete line of Fractional Horsepower Texrope V-Belts and Sheaves are presented in a 44-page Bulletin, B6249, issued by ALLIS-CHALMERS MFG. CO., Dept. T, Milwaukee 1, Wis. Simplified engineering data for fractional horsepower drives



***Uniform Temperature Handy . . . Portable Fast Heating**

• The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¾" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.).....$42.50**
For 230 V.—$5.00 additional

See your supply house or write

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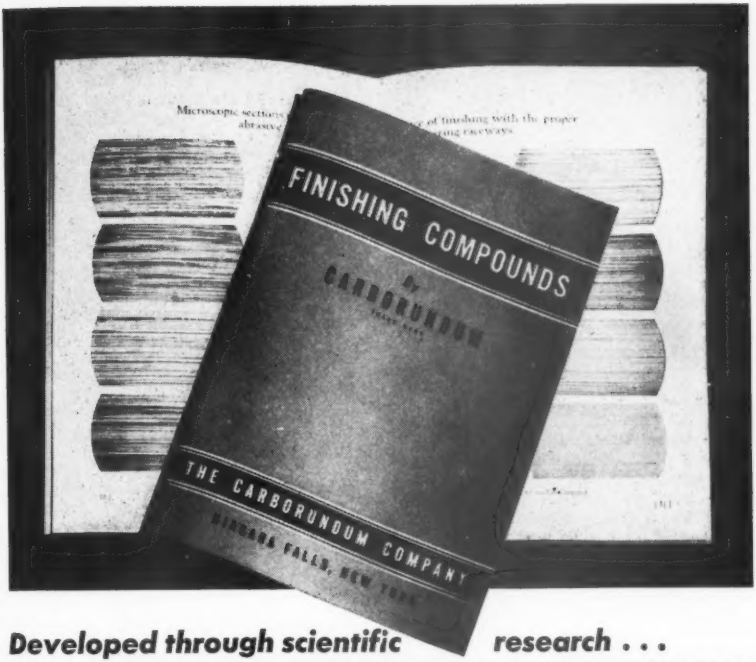

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and working formulas from which correctly engineered fractional horsepower drives can easily be derived are included. Illustrated with installation photographs, line drawings and selection tables, this bulletin will be of interest to manufacturers and operators of light duty power tools, fans, blowers, pumps, stokers, oil burners, processing equipment and numerous other appliances.
INFORM-A-GRAM KEY No. 183-Q

SPLINE & GEAR GRINDERS are featured in a 20-page booklet released by the FITCHBURG GRINDING MACHINE CORP., Dept. D, 1503 Walnut St., Fitchburg, Mass. The table type involute form truing device is pictorially described. Specifications in addition to much valuable descriptive material are included.
INFORM-A-GRAM KEY No. 115-Q

SPEEDMASTER ENGINEERING MANUAL covering the applications, care and different types of Speedmaster pulleys has been published by the SPEEDMASTER CO., Dept. D, 1201 Thacker St., Des Plaines, Ill. The Speedmaster is a double groove single-belt drive variable speed pulley designed to provide stepless, infinitely variable speed change while in operation. This compact unit involves no cumbersome moving parts, no moving of the motor back and forth, no special belts to buy and no limitations except those imposed by the carrying capacity of V-belts.
INFORM-A-GRAM KEY No. 765-Q

GRINDING OILS & LUBRICANTS for precision grinding are presented in a catalog full of illustrated descriptions published by the WHITE & BAGLEY CO., Dept. TDJ, Worcester 1, Mass. Just how Economy Grinding Lubricants (the water-soluble group), and Economy Grinding Oils, the newest contribution, are serving industry are shown. The latter were developed for use in the production of highly finished surfaces where extreme accuracy of form is demanded and where it is essential that the metal structure be undisturbed.
INFORM-A-GRAM KEY No. B56-Q

"DIE HANDLING MADE EASY" is the title of Bulletin 135 issued by LYON-RAYMOND CORP., Dept. J, 1546 Madison Ave., Greene, N. Y. Their Die Handling Trucks can be supplied in capacities up to 30,000 lbs. These trucks make it easy to keep dies in proper and orderly storage space, thus saving time in locating the die when needed for the job. The hydraulic operation requires no gears, no ratchets, nothing to slip or give way; also permits exact alignment with press bed.
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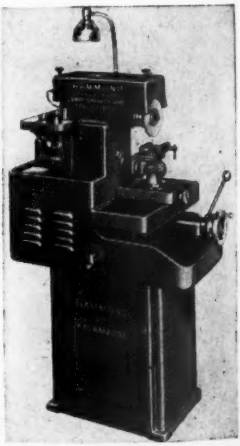

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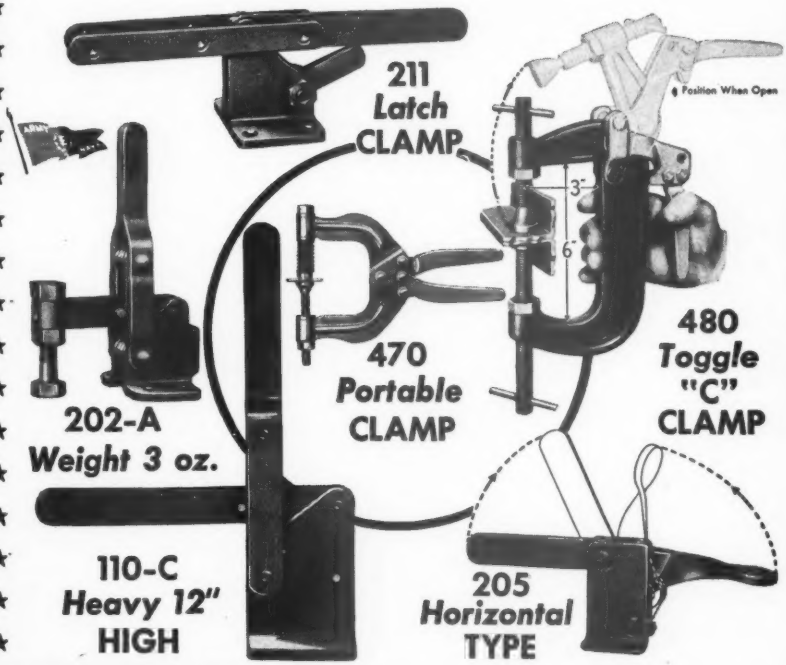

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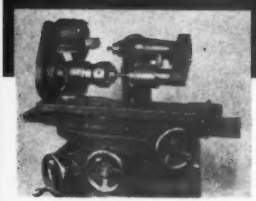
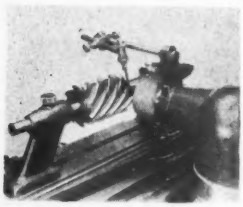


Internal Grinding



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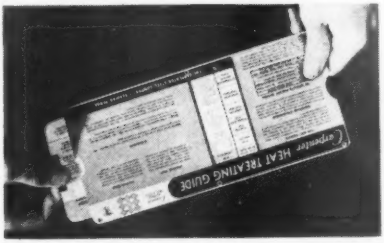
CARPENTER STEEL HEAT TREATING GUIDE. A new heat-treating guide which should prove a great convenience and time saver in the busy tool room has just been completed by the Carpenter Steel Company, Dept. T, 306 West Bern Street, Reading, Pennsylvania. In handy, easy-to-use form it gives complete information on the heat treatment of all Carpenter matched tool steels.

At a glance the heat treater can find the following information for each steel: type analysis, forging heat, normalizing heat, annealing treatment, hardening treatment, furnace atmosphere, and recommended drawing



range. In addition, he can determine for each steel on the chart the hardness for various drawing temperatures. Nowhere else is so much working information found in so compact a form.

By using the guide, the heat treater is assured of controlling hardening behavior to exact specifications, and the company is assured of fewer rejects in getting maximum performance from the tool.

Although the guide has been prepared especially for the heat treater, tool engineers and tool room foremen will find it useful as well.

INFORM-A-GRAM KEY No. B38-Q

THE USE AND CARE OF MICROMETERS is the title of a new 24-page profusely illustrated booklet just published by Sav-Way Industries, Detroit, Michigan.

This colorful booklet, designed to introduce Sav-Way master setting and checking rolls for micrometers and other precision measuring instruments, completely "dissects" the micrometer, explains in detail the functions of various parts, tells how to use it and how to take care of it. Written in simple, easily understood language and adequately illustrated by photographs and drawings, the booklet explains how the mike works, and stresses the importance of frequent checking to insure accurate readings. Also included is a valuable "do and don't" list aimed at prolonging the life and serviceability of the instrument. The booklet will be of genuine interest to any mechanic, tool maker, machinist, engineer or

student doing precision work. It is being offered free to them as well as to any shop, plant, or garage in which micrometers are used. A reasonable number of free copies are available to larger shops and plants. Write Sav-Way Industries, Box 117, Harper Station Detroit 13, Michigan, or use our
INFORM-A-GRAM KEY No. 16-Q

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GORTON FILMS "TRACER CONTROL." A new 30-minute motion picture—"An Exact Duplicate" — in colors and sound, showing many new techniques in Tracer-Controlled milling, engraving, etching and duplicating has been completed this month by the GEORGE GORTON MACHINE COMPANY of Racine, Wisconsin.

This motion picture is designed to provide its audiences with short-cut solutions to postwar production problems. It gives production men an opportunity to see Tracer Control at work on actual jobs and to hear simultaneously a description of the work as it progresses. Many of the applications of Tracer-Controlled machines shown in "An Exact Duplicate" are similar to jobs now being run in machine shops and on production lines all over the country.

"An Exact Duplicate" required more than a year to produce and it was filmed under the supervision of the same Gorton engineers who developed the Gorton line of Tracer-Controlled machines. Excellent application of close-up photography shows all features of work, master and machine. The sound commentary clearly describes each operation and enables even those not familiar with the operation of Tracer-Controlled machines to understand their efficient, time-saving application to these jobs.

"An Exact Duplicate" is available without charge for showing at meetings of technical societies, company groups, etc. All expenses of the showing are borne by the George Gorton Machine Company. Arrangements can be made by writing to the George Gorton Machine Company, Racine, Wisconsin, giving full information and the date showing is desired, together with two optional dates. Reservations for preferred dates will be made for recognized organizations in the order in which requests are received.

PROFILOMETER "TECHNICAL SUPPLEMENT." The technical aspects of the Profilometer as an electronic measuring instrument are discussed in a new "Technical Supplement" issued by Physicists Research Co., Ann Arbor, Michigan. Issued as a supplement to the company's "Profilometer Comments," the new booklet is a complete revision and enlargement of the former Technical Bulletin on the same subject. Although devoted mainly to the development and technical side of the Profilometer, a section of the book describes the entire line of equipment. Illustrations are widely used throughout the 12-page booklet. The page size is standard 8½" x 11", punched to fit a standard 3-ring binder, or the Profilometer Comments binder furnished by the company.

Copies of the Technical Supplement are available at no charge either from Physicists Research Co., Dept. 9, Ann Arbor, Mich., or by use of our convenient
INFORM-A-GRAM KEY No. 773-Q

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"EVALUATING THE FORGEABILITY OF STEELS," latest publication of The Timken Roller Bearing Company's Steel and Tube Division, is an 8½" x 11", 78-page book, containing for the first time recommended forging temperatures of sixty-eight steels, as determined by the hot twist test conducted in The Timken Roller Bearing Company laboratories, under the supervision of C. L. Clark, Timken Research Metallurgical Engineer.

The apparatus and procedures used are described and the results of tests on various steels interpreted. A free copy of the book may be obtained from The Steel and Tube Division, Timken Roller Bearing Company, Dept. J, Canton, Ohio, by writing on your letterhead.

INFORM-A-GRAM KEY No. 573.5-Q

TAP AND THREAD MANUAL—Charles H. Besly and Company have just issued a reference manual for use in machine shops and other industrial plants where taps are used in production or maintenance work.

This manual contains notes on the proper selection of taps for various types of work and provides complete tables covering tap fits, basic thread dimensions, and tap drill sizes. Recommended tapping speeds, lubricants, and angle of cutting face for various metals are also included. In addition to this basic information there are other sections giving information on special taps, tap usage, and tap sharpening.

Each page is printed on tough heavy stock and varnished in order to assure long life and to protect it from grease and dirt. The manual has a metal binding which permits the pages to be turned back on themselves or to lie flat on a bench or table.

The manual is designed as a practical aid to shop men giving in the briefest possible form all the basic data necessary for day to day reference by tool room foremen, machinist, etc.

Copies of this manual are available on request by writing to Charles H. Besly and Company, Dept. TJ, 118 N. Clinton Street, Chicago 6, Illinois.

INFORM-A-GRAM KEY No. 915.5-Q

A WEIGHT CALCULATING SLIDE RULE is announced by the Dayton Rogers Manufacturing Co., Dept. J, Minneapolis 7, Minnesota. This new slide rule automatically gives the correct weight of any sheet or strip relative to the piece part requirement as used for punch press stock. In connection with the producing of punch press products, the overall weight of a given number of pieces is always required. All that is necessary in this case is to estimate the number of pieces, lineal feet,

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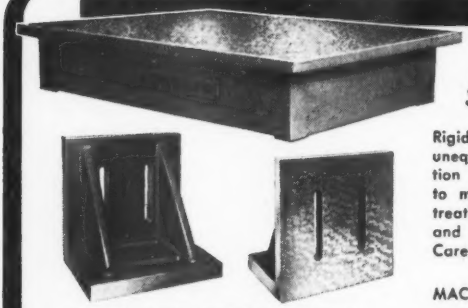

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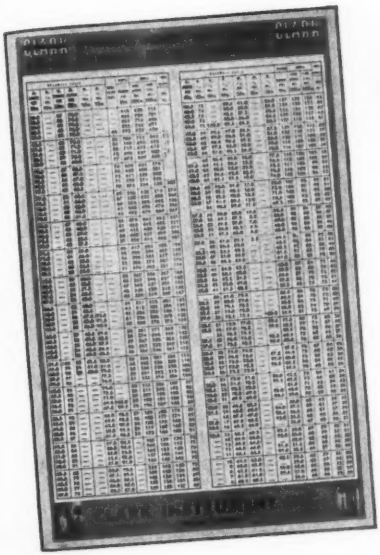

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and the slide rule will automatically give you the overall weight accordingly.

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This new slide rule is very handy for calculating weights of all sheet material used in the average punch press department, and is free upon request on company letterhead.

INFORM-A-GRAM KEY No. 619-Q

PLASTICS STOCK MOLDS, the new, revised edition incorporates hundreds of items never before pictured or described. Compiled by the Stock Mold Department of Modern Plastics Magazine, 122 East 42nd St., New York 17, N. Y., the new edition lists, describes and classifies nearly 1,600 stock molds now in the possession of scores of plastics molders and fabricators as well as nearly 200 standardized extruded cross-sections and standard laminated sheets, rods and tubes. The stock molds are classified by type of end product into 22 categories covering every major civilian use. A number of unrestricted items in war production are also shown. Each item is illustrated, described and numbered; the number acts as a cross reference to the name of the company that owns the mold. Another index gives an alphabetical list of manufacturers and their addresses. The extruded shapes and the stock laminated sheets, rods and tubes are given in separate listings. In all 6 separate indices and excellent cross-indexing makes the manual both fast and easy to use. The manual, well printed on good paper and attractively bound in blue with a red plastic backbone, is the only one of its kind and should be invaluable to every user of molded plastics. The number of copies is understood to be strictly limited. The publisher requests that remittances of five dollars per copy be enclosed with orders.

STANDARD METHODS FOR THE SAMPLING AND ANALYZING OF ALUMINUM AND CERTAIN ALUMINUM ALLOYS, the second edition of the technical manual issued by the Aluminum Research Institute, 111 West Washington St., Dept. J, Chicago 2, Ill., represents a revision of most of the methods given in the first edition published in 1932. While of primary interest to controlling laboratories, both commercial and plant, the applications cover methods for the casting alloys and suggest

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1 Holds straight shank tools up to 1" diameter in standard Hardinge Pull-In collets (Type 1-AM).
2 Quill is ground to hold No. 4 Morse Taper tools.
3 With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.
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revision which may be employed on commercial pure aluminum and for hardener-type alloys. Outlines of laboratory procedure for the determination of each metal commercially alloyed with aluminum are given. The preface to the second edition classifies methods of sampling and analysis into three categories of accuracy: A—high grade or research; B—medium grade, to cover valuation of materials for purchase, sale or duplication, checking of specifications; C—routine or factory tests, as rapid or furnace control. The type B analyses are given in this manual.
INFORM-A-GRAM KEY No. 967-Q

DURAMOLD, a well illustrated bulletin published by Duramold Division of FAIRCHILD ENGINE AND AIRPLANE CORPORATION, Dept. J, 524 West 52nd St., New York, N. Y., describes and shows applications of this high pressure bag molding plastics bonding process. Step-by-step photographs show the fabrication technique. Duramold's most recent development, electronic processing, by which high frequency currents create uniform high temperature penetration throughout large structural members, is also shown. Fixtures incorporating electric strip heaters and pneumatic pressure pads, which eliminate the hand operations of applying nailing strips and insure uniformly strong durable joints are illustrated. Methods of field repair with ordinary tools are given. While wood has been the major material used in the Duramold process, paper, glass fiber and other materials may be utilized. The principal advantages of Duramold are high strength-weight ratio, durability, moldability to complex curvatures, smooth aerodynamic surface, thin sections, resistance to climatic conditions and ease of maintenance and repair in the field. While Duramold is engaged 100 percent in the production of war goods, chiefly in the aviation field, the company is in a position to offer a limited number of licenses to qualified organizations in several fields. Full engineering, research and testing facilities are available.
INFORM-A-GRAM KEY No. B50-Q

DEPARTMENTAL FUNCTIONS IN PLASTICS MANUFACTURING, a booklet by George W. De Bell and distributed by Industrial Magazine Service, Inc., Dept. D, 122 E. 42nd St., New York 17, N. Y., covers a plan for the division of all activities in a plastics manufacturing plant into five functional groups. These are sales, engineering, production, inspection and administration. Emphasis is placed on the responsibilities which each department or division should assume. Both product and tool design are responsibilities, for example, of the engineering department as also are estimating, experimental manufacturing and development. The inspection department is considered

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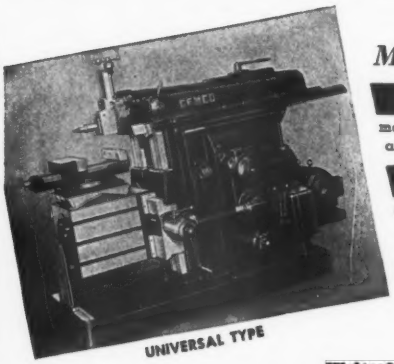

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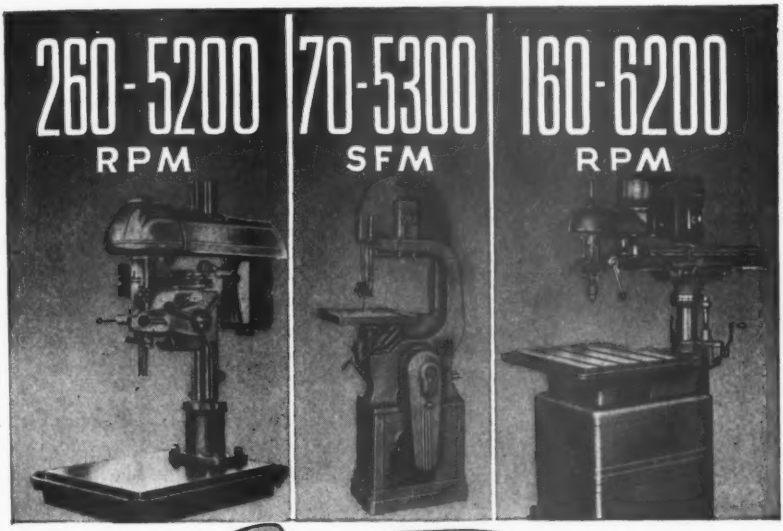

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a relatively important and independent function since it may be called upon to place the responsibility for defective or inferior products. A custom shop molding a variety of intricate parts would have more inspection equipment and personnel than one molding standard or proprietary items. The arguments for functional divisions are well thought out. An organization chart is included.
INFORM-A-GRAM KEY No. B49-Q

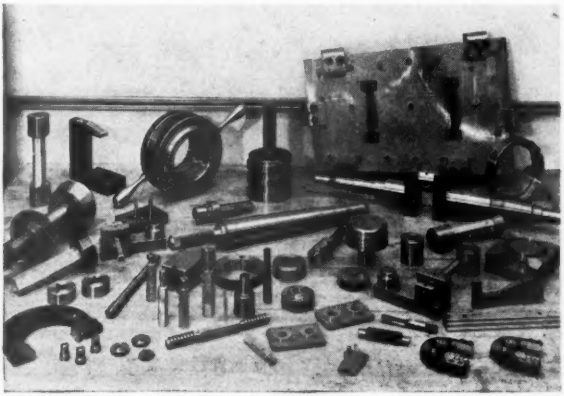
N E ALLOY STEELS, FACTS AND FIGURES FOR PRACTICAL USE, the third revised edition of this very useful booklet has been issued by Joseph T. Ryerson & Son, Inc., Dept. T, 16th and Rockwell Sts., Chicago, Ill. In addition to the standard listing of the N E steels, there is a description of the Jominy End-Quench Hardenability Test, a guide to the interpretation of Jominy results and tables on cooling rate in Jominy test, cooling rates of round bars, approximate physical properties in relation to hardness and approximate relationship of drawing temperature and tensile strength. Copies may be obtained from the general office, address above, from a district sales office or from a Ryerson Steel-Service plant.
INFORM-A-GRAM KEY No. 451-Q

NORTON FOLKS CONTRIBUTE TO INDUSTRY was designed for and distributed to Norton Company employees to "make them, particularly the newer employees, more familiar with the types of products they are producing, their field of application in industry, the importance of abrasives in industrial production, and in many company achievements in which we take pride." We believe this attractive book, largely consisting of photographs of processing by and applications of Norton products certainly has achieved its announced objective. It is of interest to executives, engineers and other technical men who are concerned with the use of abrasive products. Copies may be obtained from the Norton Company, Worcester 6, Mass.
INFORM-A-GRAM KEY No. 545-Q

CUTTERS are described and illustrated in Catalog 43 published by EKSTROM, CARLSON & CO., Dept. TJ, 1439 Railroad Ave., Rockford, Ill., designers and manufacturers of high production cutters, woodworking, metalworking and aircraft machinery, special single purpose machines, dies, tools, jigs and fixtures. With the necessity for high production schedules in aircraft, and with the advent of Plexiglas and the use of plastic materials, a new field was opened to the use of their routing machines which were originally designed and built for the working of wood.
INFORM-A-GRAM KEY No. 152-Q

All in the DAY'S WORK AT

MERZ



● Paraphrasing the old adage—if you want a job well done, ask an *experienced* man to do it for you!

This company is experienced in designing and manufacturing *the widest variety* of gages, tools and fixtures, special and "pilot model" machines and parts for war, commerce and industry. Our equipment is as new as the market affords, our facilities are thoroughly modern in every respect, and our craftsmen are among the most skilled in the business.

If it is made of metal, MERZ can design and make it for you.

Standard plug and ring gages shipped from stock. Send for literature "Four Spheres of Service" which gives complete information.

MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA

AMERICA'S BIGGEST BENCH MILL for only $350.00
Diamond
B-12 BENCH MILL
IT'S STURDY! 435 lbs. of carefully designed, accurately machined castings.
IT'S ENGINEERED! Timken tapered roller bearings on the spindle. Needle bearings in the overarm bracket. Spindle heat treated, nose hardened and ground. Screws protected from chips. Many modern features.
IT'S FLEXIBLE! A wide range of spindle speeds (from 100 to 1400 r.p.m.) for small end mill operations or heavy cuts with large diameter milling cutters. Accessories include vertical milling head, power longitudinal screw feed, rack and pinion feed, coolant supply, etc.
IT'S POWERFUL! Double vee belts put plenty of power on the spindle—speeds are quickly altered by flipping the belts on pulleys. Rapid belt adjustment keeps belts tight or instantly releases tension for belt changes. Recommended motor sizes ¾ to 1½ h.p.
IT'S ECONOMICAL! Model B-12 Diamond Bench Mill is sold on M.R.O. for only $350.00 F.O.B. Los Angeles. Write for specifications and information!
DEALERS WANTED! FOR MORE INFORMATION WRITE
DIAMOND TOOL COMPANY
3427 E. Olympic Blvd., Los Angeles 23, Calif.
MODEL B-12 DIAMOND BENCH MILL
DIAMOND
DTCo
Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories

Knurling of Socket Screws Originated with "UNBRAKO" Years Ago.

FINGERS DON'T SLIP ON UNBRAKO SOCKET HEAD CAP SCREWS

Every time a screw is used, time can be saved if it's a KNURLED "UNBRAKO" SOCKET HEAD CAP SCREW. The mechanic can get a firm grip on the knurled head, even with greasy, oily fingers. He turns the screw FASTER and FARTHER with his fingers before he has to use the wrench.

Send for the "UNBRAKO" CATALOG and look further into this important subject.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 600

— BRANCHES —

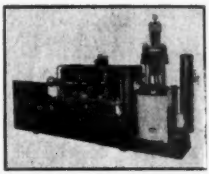
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

DIECASTING DIGEST

IV—Demand for better zinc die castings brings new machine

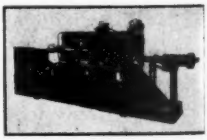
Anticipating demands for better zinc die castings at lower cost the Lester Engineering Company of Cleveland has developed a new die casting machine for zinc, tin and lead alloys which is said to be the fastest cycling commercial die casting machine ever built.

The new Model HHP-1 is a smaller adaptation of the big Lester-Phoenix HHP-3, embodying the features of the large machine at a lower price. It combines a cycling speed of 400 to 500 shots per hour (actual production; speed without load is 750 cycles per hour), with higher injection pressures than other zinc die casting machines of similar size and rating.



New machine for zinc alloys

Outstanding features of the new machine are: (1) Beam-type frame is a rigid one-piece alloy steel casting. (2) Extremely rapid die plate movement hydraulically actuated by double toggle link mechanism. (3) Single die height adjustment by a large centrally located Acme thread screw. (4) Quickly convertible for aluminum, brass or magnesium die casting. Readers may obtain literature and specifications by writing to Lester-Phoenix, Inc., 2625 Church Avenue, Cleveland 13, Ohio.



... convertible for aluminum

See it at the
NATIONAL METAL CONGRESS IN CLEVELAND
OCTOBER 16 THROUGH 20

The post-war market for zinc die castings will demand a higher production rate and lower cost, and the new Lester-Phoenix HHP-1 is specifically designed to meet this demand. Incorporating features of the large HHP-3 at a lower cost, it is the fastest cycling commercial die casting machine ever built. Castings are of highest quality—dense, homogeneous, strong. Beam-type frame with sturdy structure and rapid cycling cuts costs, flash, rejects and maintenance.

This machine is quickly convertible to cold chamber die casting of aluminum, brass and magnesium. But get the complete story from:

Write **TODAY!**
COMPLETE DATA
and specifications on the HHP-1 (Zinc) and HHP-1CC (Aluminum) sent on request.

LESTER-PHOENIX, INC.
2625 Church Avenue, Cleveland 13, Ohio

LESTER-PHOENIX
DIE CASTING MACHINES

Looking at .00002 OF AN INCH . . . !

Soon new precision gages for peacetime production will be needed. Haines offers you a dependable source of supply with the "know-how," experience and facilities to produce working and inspection gages to your specifications. You can stake your reputation on Haines Gages. Send us your inquiries. Request illustrated circular. HAINES GAUGE CO., 2301 W. Allegheny Ave., Philadelphia 32, Pa.

Haines

PRECISION GAGES

PLUG • RING • SNAP • FLUSH PIN • PROFILE • ETC.

PUT THEM TO ANY TEST -

RIGHT IN YOUR OWN PLANT ...

HERMAN

Precision Granite

SURFACE PLATES

Patent Pending

Discover for yourself the advantages of HERMAN *Precision Granite* SURFACE PLATES—advantages that have made them the preference of scores of important plants engaged in important war work. We'll send you a sample plate, on approval, to be tested in your own plant. HERMAN *Precision Granite* SURFACE PLATES are positively accurate to .0001 overall; they're hard, smooth, warp-proof, non-magnetic, non-corrosive. Available in many sizes at reasonable prices.

Write today for descriptive folder, technical data, and a sample for test in your plant.

(Write for Comprehensive Report by Well-Known Technical Laboratory.)

A FEW TYPICAL USERS OF HERMAN GRANITE SURFACE PLATES

U. S. Bureau of Standards
General Motors
Chrysler Motors
Ford
General Electric
Westinghouse Electric
Allis-Chalmers
International Harvester
Curtiss-Wright
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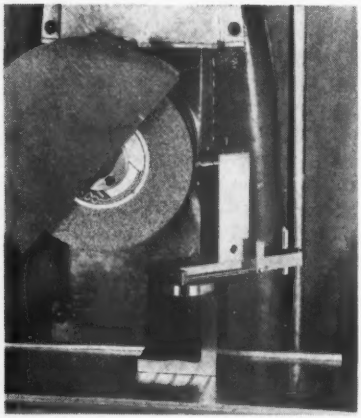
The Herman Stone Co.

1243 LEONHARD STREET, DAYTON 4, OHIO

The FORM-MASTER

ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. quality diamonds and instrument case included . . . $150.00.

It readily produces: Any desired angle; Convex radii to 4"; Concave radii to 7". On 7" wheel.

Specifications: Base 3"x 3", Height 8½"; Wheel capacity 10"; Angular travel 3".

For information or a demonstration CALL YOUR SUPPLIER.

MANUFACTURED BY

J. & S. TOOL CO.

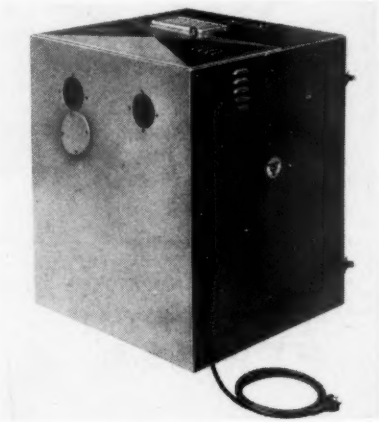
477 Main Street, East Orange 4, N. J.

• PRECISION DRESSING TOOLS •

Self-Contained Individual Machine Dust Collector

The compact, self-contained Delta-Milwaukee Dust Collector, designed for use with an individual machine, was recently announced by the manufacturer The Delta Manufacturing Co., 613-L E. Vienna Ave., Milwaukee 1, Wis. The unit is provided with special fittings allowing its attachment to any of several Delta-Milwaukee machine tools.

The new dust collector is activated by a powerful fan which sucks in both fine and heavy dust and small particles



against the surfaces of an efficient air filter. The large particles fall from the filter surfaces into a removable pan at the bottom. The smaller particles cling to the filter surfaces. The filter is a permanent type, presents a low air resistance, is fireproof and cleanable. The company states that a special woven glass filter for collecting "flour fine" dust is also available. This filter is attached directly to the standard filter.

The pressed steel cabinet is finished in Delta grey. The blower or squirrel-cage type of fan moves 350 fpm and develops a static suction of 3 to 4". The 1/3 hp motor has sealed-for-life ball bearings and is located in a separate sealed compartment insulating it against dust.

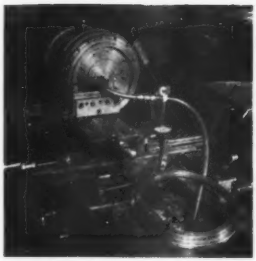
INFORM-A-GRAM KEY NO. 51-Q.

NEW AND REVOLUTIONARY

MAGNETIC CHUCKS

FOR

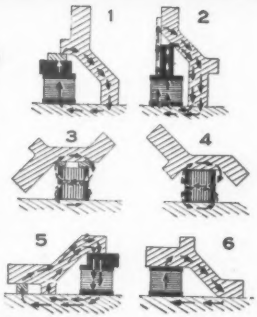
TOOL ROOM AND PRODUCTION



Following the arrows will quickly show how you may utilize the new Magnetic Circuit of our POWER-GRIP Chuck on surface grinders. The combinations of blocking, shimming, etc., are only limited by the operator's experience and imagination. The holding power lost through the various blocks is negligible.

On a 10" cast iron ring, in Detroit—"We are pleased to say this has meant a 300% increase in production and a 5% decrease in scrap to this item."

Square Tool, Die & Mfg. Co.
(Signed) W. JACKSON,
Factory Manager.



Furnished complete with combination Power and Control Unit for 110 Volt A.C. Circuits, from stock

ROCKFORD MAGNETIC PRODUCTS CO.

1019 Sixth Avenue, *(Card brings Catalog)* **Rockford, Illinois**

(1) *Damaged blades before reconditioning.*
(2) *Initial removing of paint and heavier pit burrs.*
(3) *Final polishing before recoating.*
(4) *Elimination of deeper pits, and smoothing.*

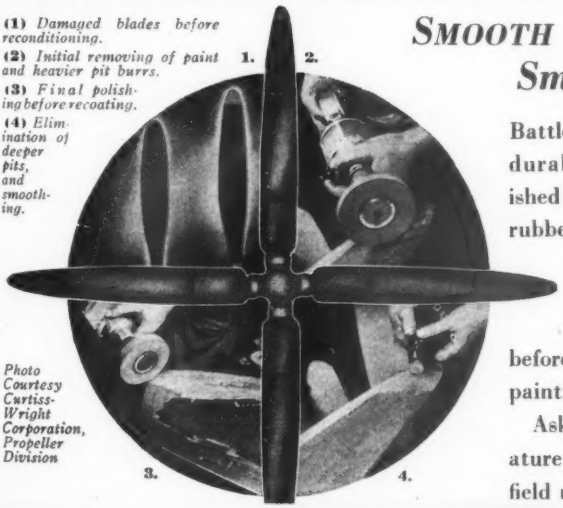


Photo Courtesy Curtiss-Wright Corporation, Propeller Division

SMOOTH FINISH— Smooth Flight!

Battle damaged steel and dural propellers are refinished faster, better with rubber cushioned Brightboy, employed in the vital operation of reducing burrs and pit marks before recoating and repainting.

Ask your dealer for literature and prices. Brightboy field men are at your service.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
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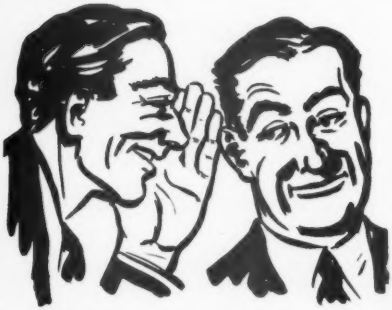
WELDON ROBERTS
Brightboy



WHISPERING CAMPAIGN

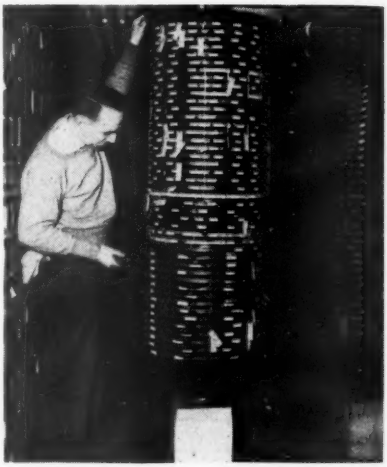
Word of mouth travel has built up a list of almost 1,000 users of Strenes metal ranging over 36 states and employing this unusual alloy in many ways.
Its principal use is for drawing and forming dies . . body tops, fenders, radiator grills, hoods, lamps . . . refrigerator tops,

sides, doors, trays . . . stove parts, tractor parts, farm implement parts, caskets, grave vaults, etc.
Strenes can be cast very close to shape (usually 1/16") . . . thereby greatly reducing machining time. Its graphitic lubrication rate is very high, hence runs of 1,000,000 deep draw parts are not unusual.
Here is an alloy you should look into and we are ready to cite hundreds of plants for you to contact on the subject.
Also . . no matter how extensive your tooling program Advance has the capacity to handle the casting end and give you excellent service.

THE ADVANCE FOUNDRY CO.
DAYTON 3, OHIO

Turntable Rack

A turntable mounting for a tier of circular wooden shelves to provide storage for 400 snap gages is in operation at the Fort Edward Plant of General Electric. Divised by C. S. Loughlin of the plant's Planning Department both for accessibility and to conserve floor and wall space, the rack has shelves spaced to



accommodate different thickness of snap gages. Separators between the various sized gages permit the maximum use of rack area in each tier element.

When a gage is removed, a tag is attached to its space in the rack. Since the gages are issued and returned daily, the turntable permits much faster crib service than the conventional wall racks. A pipe rail attached to both bottom and top shelves facilitates, as the illustration shows, the turning of the rack. The entire tier is mounted through the center on an iron pipe which rests on a ball bearing on the bottom and runs through a roller bearing on the top.

★

A booklet "Weldwood" describes and pictures selected applications of the major types of plywood made by the United States Plywood Corp., 616 West 46 St., New York, N. Y. Waterproof Weldwood, the first phenol formaldehyde bonded plywood, is shown in a number of service applications. B36-P.

Grobet

ROTARY FILES

HAND CUT — MILLED CUT
GROUND FROM THE SOLID

There is a Grobet Rotary File, Cutter, Diesinker's Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.

Send for Catalog Y. R. illustrating the complete line in full size, speed charts, etc.

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IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

PLANTS: NEW YORK, CHICAGO, LOS ANGELES

SAVE TIME

ON BORING-TOOL SETTING

For Retooling . . .

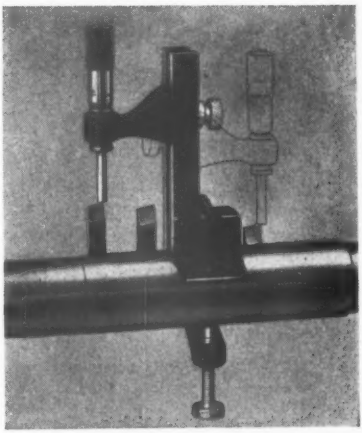
Take *one* trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



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ENGINEERING COMPANY
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A. S. A. STANDARD DRILL JIG

BUSHINGS

Prompt Delivery from Stock

- HEADLESS PRESS FIT
- HEAD PRESS FIT
- FIXED RENEWABLE
- SLIP RENEWABLE
- HEADLESS LINERS

also

SCREWS • CLAMPS
LOCATING JIGS

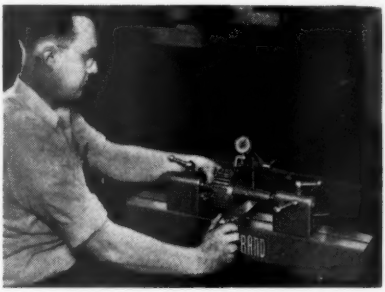
Send for New Catalog No. 243

ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

New Improved Bench Center

Precision checking of work between centers is made simpler and faster by the design of the new improved Bench Center recently anounced by the Sundstrand Machine Tool Co., Dept. D, Rockford, Ill. Accuracy can be maintained to within limits of .0001" in checking for runout.

Unclamping, positioning and locking in place of both the LH and RH heads are easily achieved with a single hand operation of the top levers. The "one-handed control" of all moving elements allows the operator's second hand to be free to control the part being checked. The LH head center is fixed; that in the RH head is spring loaded and can be retracted by the end bar for quick loading and unloading. The front clamp on the RH head locks the center in position during the checking operation. The indicator support is manipulated with one hand when moving it away from the work for loading and unloading and against the work when checking for runout.



The new Sundstrand Bench Center is compact, portable and easily cleaned. Center holes of both LH and RH heads are bored together for accurate alignment. The heavy ribbed base prevents deflection under clamping and unclamping, assuring a longer lifetime of accuracy.

The Bench Center, available in six sizes for every toolroom use, includes the bed and two heads as standard equipment. A dial indicator with an adjustable holder is available as extra equipment.

INFORM-A-GRAM KEY NO. 36-Q.

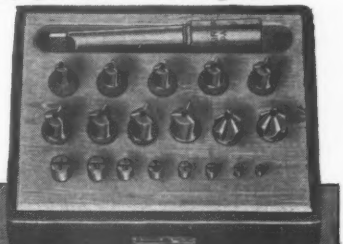
COUNTERBORE SETS

Today's war production program demands accurate, efficient cutting tools *within easy reach.* Gairing standard kits provide the answer for counterboring and spotfacing operations. Seven sets from which to choose. Each contains a logical assortment of *interchangeable* counterbores, pilots and holders boxed in sturdy cases.

THE GAIRING TOOL CO., Detroit, Michigan

For a quarter century specialists in fine cutting tools.

The set illustrated here consists of one Type A-1 holder, 9 cutters ranging from ¼" to ½", 8 pilots from 5/32" to ⅜", 2 countersinks ½" dia., 70° and 82°. *Write for catalog and prices.*



Gairing TOOLS

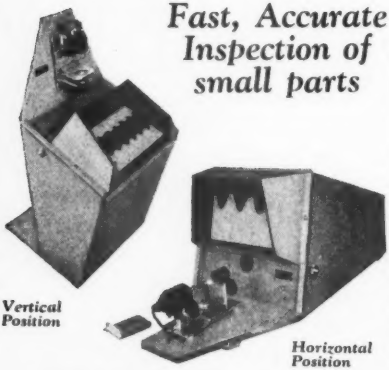
SMITH MASTER SURFACE PLATES HOLD THEIR PRECISION

Even the weight of a feather will produce some deflection in the working face of a Surface Plate. But the Smith scientifically designed, deep, elliptical ribbing and sturdy cross-bracing limit deflection under loads to a very minimum. Lapping plates of the same design, and stands as shown also available.

SMITH TOOL & ENGINEERING CO.
858 N. SANDUSKY AVE., BUCYRUS, O.

FS Optical Contour Comparator

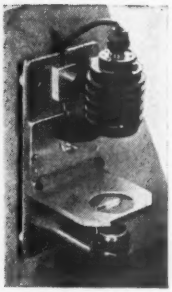
Fast, Accurate Inspection of small parts



Vertical Position

Horizontal Position

Can be used in either horizontal or vertical position



Stage on which object is placed

With the FS Optical Contour Comparator you can make fast—but detailed—visual inspection of small intricate shapes such as screw threads, dies, gears, or parts of instruments, gauges, etc., checking their height, width, thickness, radius, etc., in a few seconds.

Accurate projection of the contour of the part being checked is instantaneous. An unlimited number of similar objects can be checked in rapid succession after one preliminary adjustment.

The Comparator's powerful aspheric condenser system and special lens produce an instantaneous accurate screen projection with a definite magnification of 24x. Other magnifications on special order. The unit is convenient, compact.

Write today for Bulletin OC-292.

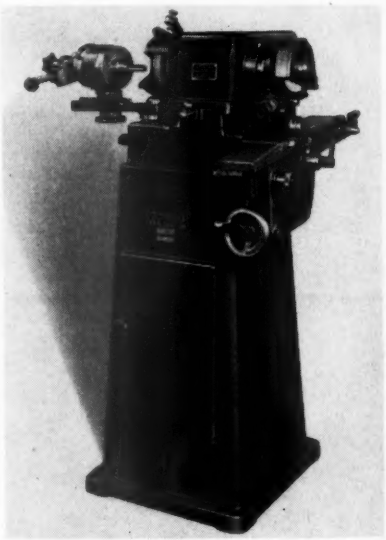
FISH-SCHURMAN CORPORATION
230 East 45th Street, New York 17, N. Y.

Fish-Schurman

Tap Reconditioner Design Improved

An improved design of its Model DTR-3 Tap Reconditioner on which all operations necessary for keeping taps in "top" condition is now available from Detroit Tap & Tool Co., Dept. T, 8432 Butler Street, Detroit 11, Mich.

By the addition of facilities for grinding the full length of the tap flutes, the new Tap Reconditioner has become a "4-in-1" machine, since the machine's original functions included chamfering, spiral pointing and spiral point polishing. Taps with 2, 3, 4, 5, or 6 flutes may be ground on one head. The entire flute grinding and spiral pointing unit is now of the sliding table type for increased accuracy and easier grinding.



A new feature is a chamfering head which employs "quick change" type collet chucks for standard type shank sizes, allowing greater speed in reconditioning taps. These chucks are interchangeable between the chamfering unit and the flute grinding and spiral pointing unit and are attached by means of a simple draw bar.

Capacities of the chamfering unit—at

(TO PAGE 212—PLEASE)

In War, as in Peace...

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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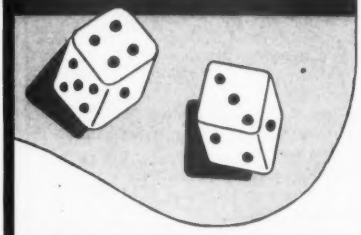

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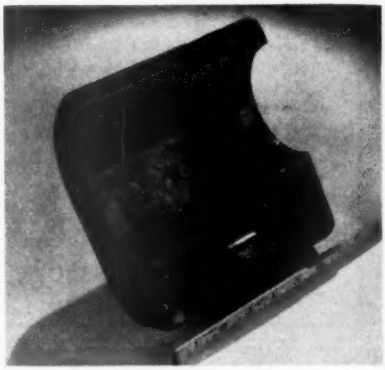
Plastics Plating Mask

A 35-ounce plating mask for use in chrome plating military aircraft landing gear struts is being injection molded of Saran by the St. Louis Molding Company, St. Louis, Mo. Said to be one of the largest Saran parts so molded, the mask required a cycle of only 70 seconds on a modified Watson Stillman machine.

Saran, a series of thermoplastic resins



(vinylidene chloride) is a product of the Dow Chemical Company, Midland, Mich. Its high chemical resistance, lightness and metal-like strength and toughness made Saran particularly suited for use as an impenetrable mask to prevent plating certain parts of landing gear and to localize the chrome treatment to the desired area. The mask plate is reported unaffected by the highly corrosive elements of the plating solution.

Saran B-115, the material supplied for injection molding, is furnished in pellet form. The Dow Chemical Company, in cooperation with the manufacturers of injection molding machines, has developed designs and specifications for heating cylinders to be used with Saran B-115. It is essential that portions of the heating cylinder with which the material comes in contact at molding temperatures be of nonferrous metals. This and other features of the recommended modification are detailed in a booklet "Saran for Injection Molding" available from The Dow Chemical Company.

INFORM-A-GRAM KEY NO. 275-Q.

Yes, these screws save Time and Space!

No matter how close to a corner or flange you put Mac-it hexagon socket screws, there's plenty of room to drive them. Use this advantage to save space.

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OTHER MAC-IT PRODUCTS INCLUDE: Socket head and hexagon head cap screws, stripper bolts, hollow and square head set screws, hexagon socket pipe plugs.

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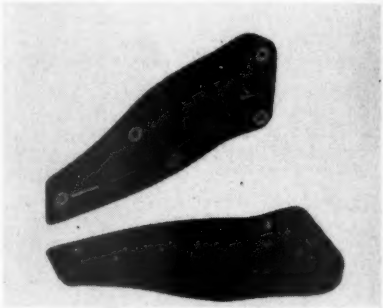
Replaceable Molded-in Inserts Hold Gun Control Handle

The use of Rosán Replaceable Molded-in Inserts which serve as internal fastening points for a plastic gun turret control valve handle is one of the recent applications reported by the manufacturer of the Rosán Locking System, Bardwell & McAllister, Inc., Dept. TD, Box 1310, Hollywood 28, Calif.



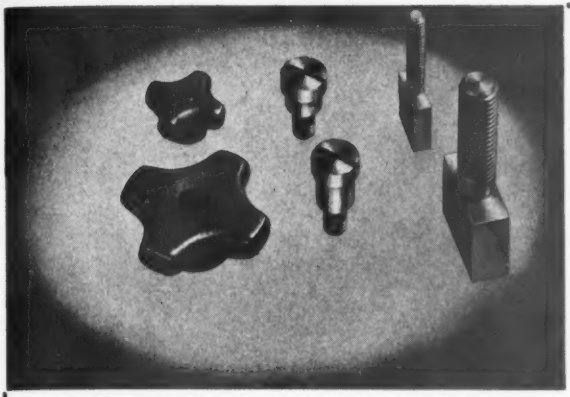
The Rosán Locking System operates on a unique principle. A locking ring, serrated inside and out, engages its inner teeth with those of serrated collar on the Rosán Insert or Stud. When pressed or driven into place, the outer splines broach the walls of a counterbore and lock the unit firmly in the parent material.

The illustration shows the locking rings in place, the internal serrations engaging the mating serrations of the insert collar. To remove the insert, drill to the depth of the locking ring with a drill large enough to destroy the bond between serrations on the ring and the insert collar. An "easy-out" tool or socket-head bolt-wrench is then used to remove the insert.

Rosán Studs are installed in the same manner as the inserts except that a hollow drive tool is used for the locking ring. Studs are removed by hollow milling to depth of the ring or by the use of a hacksaw and pilot drill.

The Rosán Locking System is used for many fastening and sealing applications. The Rosán Locking System Catalog gives complete specifications.

INFORM-A-GRAM KEY NO. B79-Q.



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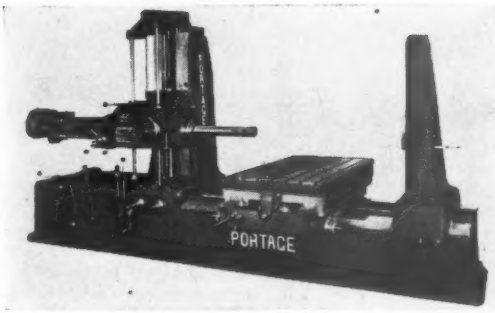

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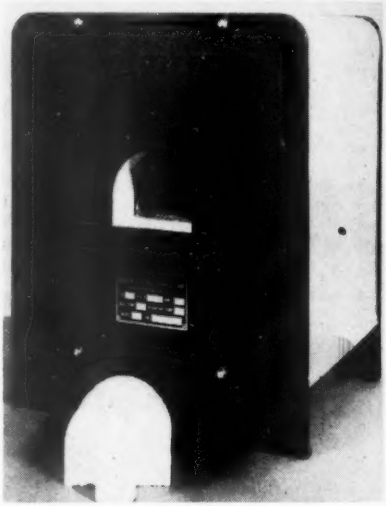
High Temperature Laboratory Furnaces

A complete line of high temperature laboratory furnaces with maximum temperatures of 2750° F and operating temperatures of 2500° F is announced by the Harper Electric Furnace Corporation, Dept. D, Niagara Falls, N. Y.

The Harper furnaces are built for industrial and research laboratory uses where materials are to be heated in an oxidizing atmosphere at temperatures



above those attainable with metallic elements. The laboratory furnaces are heated with Globar brand non-metallic elements located above and below the silicon carbide muffle to assure uniform distribution of heat. The furnaces have many applications where special conditions are involved, such as rapid heating or heating in special atmospheres not injurious to silicon carbide.

The furnaces are made in various sizes with chamber dimensions of 2⅝" x 3½" x 5" and 5½" x 6" x 18". Either plug type or counterbalanced doors are available. Both bench and floor mounting models are standard. The company will furnish complete specifications on request.

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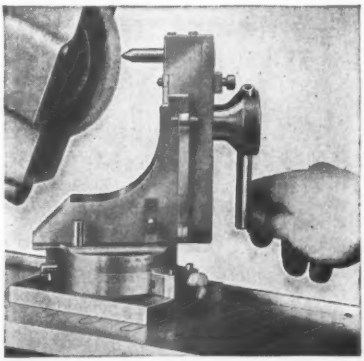

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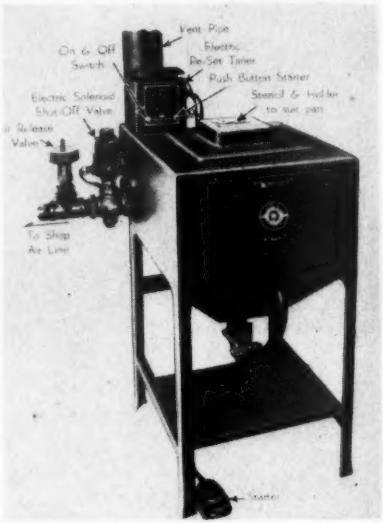
"Airgrit" Marking Unit

The Matthews "Airgrit" Marking Unit, designed for marking without marring or distorting delicate and precision parts that have a ground or mirror surface, by employing a short blast of fine grit material is announced by Jas. H. Matthews & Co., Dept. TD, 3896 Forbes St., Pittsburgh 13, Pa. The grit material is air driven against rubber or



plastic stencil masks on which the part to be marked is placed. The marking—number, symbol or design—is cut into the stencil. The resulting mark is a light and clear cut impression. Suitable fixtures hold parts for speedy handling by the operator.

The unit operates on low pressure, 5 to 8 pounds at the nozzle and uses approximately 30 cfm. A solenoid valve and timing unit regulates the length of blast. The timer allows from ¼ to 14 seconds setting and shuts off automatically. A reducing valve and gage, not furnished with the unit, are required when the shop air-line is used. An air filter or oil separator is recommended also for installation between the reducing valve and the unit.

INFORM-A-GRAM KEY NO. 50-Q.

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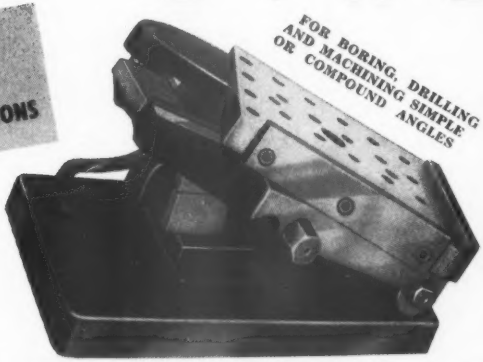
NO LONGER NECESSARY TO OBTAIN ANGLES OF ROTATION FROM GRADUATIONS



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Available in 5 inch and 10 inch models.
Table sizes—

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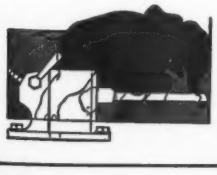
Pneumatic

"FLAT TOP"

WORK HOLDER

This new type of air-operated fixture for holding small flatwork for toolroom use or production operations solves a troublesome problem. Mead "Flat Top" holds any work which is flat on the bottom, regardless of peripheral contour. Assures "dead true" perpendicularity for drilling, reaming, tapping operations. Completely described in the new Mead Air Power Catalog . . . just out.



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No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column

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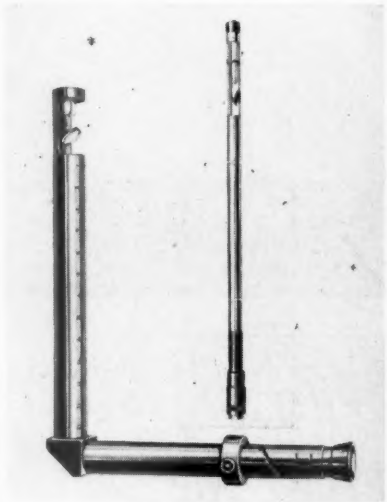
Borescope for Internal Surface Inspection

A line of borescopes particularly recommended for inspection of internal surfaces of bored engine shafts, hydraulic and other cylinders and tubular bodies is now available for private industry according to the manufacturer Polan Industries, Dept. T, 608 Fifth Ave., Huntington, W. Va.

Originally designed for the internal surface inspection of gun bores, Polan



Borescopes combine the qualities of a highly corrected lens system and of excellent interior illumination with the rugged design necessary for continuous shop use. The instruments supply a clear and magnified view of bore surfaces, do not cause eye strain when operated all day long and do not require special operator training.

Polan Borescopes are available in a very complete range, in diameters from $\frac{13}{18}$" to 9" and in bore length up to 30 feet. Illustrated are a straight standard borescope and a borescope with right angle eye piece extension. A number of special borescopes and a wide variety of special attachments have been developed. These are described in a bulletin which may be obtained upon request.

INFORM-A-GRAM KEY NO. B73-Q.

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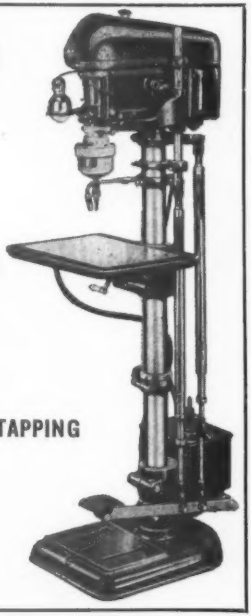
With Less Tap Breakage

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines *so sensitive* that even unskilled operators can detect an overloaded or dull tap—or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accuate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate; One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.



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giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

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Pressed Metal Products Industry Advisory Committee Favors Removal of Present Price Controls

Recommendations to adjust price controls on stampings for post-war civilian products were made by the Pressed Metal Products Industry Advisory Committee at a recent meeting reported by the War Production Board. The Committee recommended that present price controls on made-to-order job stampings be removed immediately by the Office of Price Administration. Members pointed out that the competitive situation resulting from the expansion of stamping facilities to meet war demand will hold prices at their "proper" levels without any OPA regulation. They said that products using pressed metal parts should be priced now even though they are not to be manufactured until several months after the termination of most war work.

As an alternative proposal, if OPA cannot immediately remove price regulations, the Committee recommended that a "percentage allowance" of March, 1942, prices be set up for the industry in order to determine prices of stampings for future civilian products. The proposed price change, made through percentage adjustment of prices as frozen by OPA in March, 1942, would be based on the difference between the former and current production costs.

Such action, Committee members said, would minimize detail work necessitated by OPA's procedure for establishing individual relief on prices, and would not result in higher prices in all cases.

Sheet and strip steel probably will be in better supply in the fourth quarter, 1944, than at present, a representative of the Steel Division informed the Committee. He urged the pressed metal products industry to order the smallest possible quantities of raw materials now to avoid carrying excessive inventories for war production and lessen raw material claims in contract settlements.

★

(CONTINUED FROM PAGE 200)

the left of the machine—and the grinding and pointing unit have been increased. They will now take collets up to 1¼" standard tap shank size, including long shank taper taps.

The new spindle head accommodates a wide range of motor types interchangeably. A separate motor driven unit with cone-shaped wheel for spiral point polishing, etc., is standard equipment. Bulletin No. TRM-2 is available.
INFORM-A-GRAM KEY NO. 134.5-Q.

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Universal Drill Bushings save valuable tool drills. Super finished bores insure accuracy and unexcelled wearing qualities. All standard sizes available. Write for catalog.

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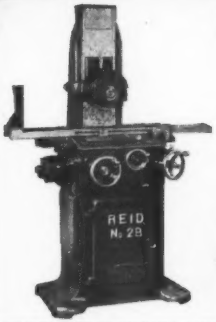

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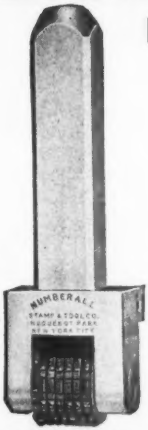

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NUMBERING MACHINES FOR STAMPING INTO METAL, ETC.

STAMP NUMBERS, etc. Quickly — Neatly PERFECTLY ALIGNED

Can be furnished with Shank for Press and with any number of wheels from 3 to 20.

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Resinoid-bonded for grinding of carbide-tipped tools in large quantities. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.

Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

Catalog on request.

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157 Chambers St. New York 7, N.Y. 5400 Tireman Ave. Detroit 4, Mich.

(CONTINUED FROM PAGE 103)

need for inside grinding was avoided by inserting carbon rods in the holes before starting the deposit.

The V-block inserts shown in Figure 3 were faced with Stoodite 63. This is a cast rod containing cobalt, chromium, tungsten, molybdenum, vanadium, carbon and iron. It is furnished bare and for oxyyacetylene welding application only. The deposit is extremely hard but can be ground without danger of cracking or of encountering porosity, and is very resistant to abrasion at high temperatures. It is best applied with a soft flame and a comparatively large tip. Holding the tip of the inner cone of the flame close to the parent metal helps to control the size of the puddle and increases the speed of application. Deep penetration is not required. The photograph shows the smoothness of deposit which can be obtained with this alloy.

An oxyacetylene application of Borod to a set of feed blades is shown in Figure 4. Borod is a fabricated rod composed of fine particles of Borium (a tungsten carbide) enclosed in a mild steel tube. The deposit is therefore heterogeneous, yet the particles in the steel matrix are so fine that surfaces faced with this material wear almost as smooth as though deposits were homogeneous. It can be applied very sparingly and is therefore well adapted for facing surfaces of thin cross section. A thin coating possesses unusual toughness and impact reistance combined with maximum wear resistance. When applied with the oxyacetylene torch, a definitely carbonizing flame is used and the deposit is barely fused to the surface of the parent metal so that the embedded particles of Borium will be on or near the surface of the deposit. Borod is also supplied in coated form for electric arc application.

These examples have not been chosen for their size, nor for any unusual difficulties of procedure involved, but rather for their simplicity—to illustrate economies which can be realized by making good use of welding in the ordinary run of tool and die work. The use of very small amounts of hard-facing materials at areas of critical wear multiplies the useful life of expensive tools. At the same time the fabrication cost of the body of the tool can be greatly reduced.

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5000 SHAPES and SIZES TO CHOOSE FROM

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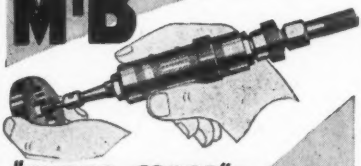
M·B MODEL SS-SR



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A 100,000 R.P.M. UNIT

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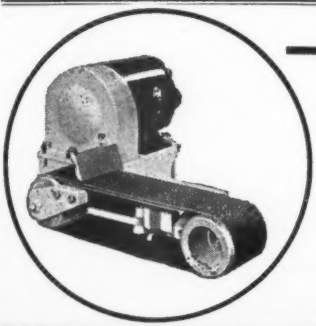

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QUICKLY, EASILY REMOVED
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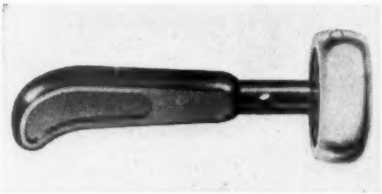
Improved TeBo Gages in Production

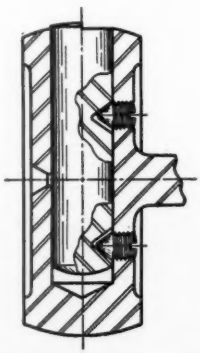
The Standard Gage Company, Inc., Dept. T, Poughkeepsie, N. Y., announces that it is now in production on the improved TeBo Gages. The company is the sole licensee in the Americas of this fixed limit type of gage which has long been a favorite of Swedish and other European precision workers.

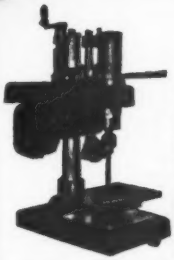
The TeBo Gages, as some American users have learned, can not only do the



work of the familiar plug gage but, because of the spherical gaging head and the adjustable maximum tolerance inset, these gages have the capacity of cylindrical and pin gages in combination. Maximum and minimum bore diameters may be gaged in one operation with extreme accuracy.

The gaging head is a section of a sphere with a protective plating of hard chromium. Due to the plating and the fact that the points of gaging contact are as numerous as the number of theoretically widthless lines which might be inscribed on the surface of a sphere.





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Send for literature describing the line of Oliver Die Making Machines!

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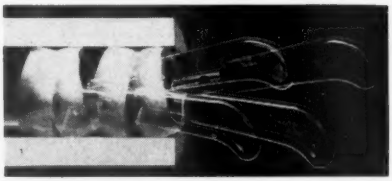
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.

TeBo Gages retain their extreme accuracy over exceptionally long periods of service. Records of 50,000 gagings with a single gage are on file.

The spherical head contributes to frictionless operation and effortless insertion and withdrawal of the gaging head when checking bores. A smaller projection, also a part of a true sphere, acts as the adjustment to the limit of maximum tolerance or to compensate for wear. The adjustment is easily made by means of two tapered screws acting against the inset in a "V". By adjusting these screws the "no go" factor can be increased or decreased within the gage's dimensional limits and held constant to various tolerances. This adjustability is a recent Standard improvement.



The TeBo gage head enters a bore freely and may be rocked on its horizontal axis until stopped by contact of the projection with the bore wall. If the bore exceeds maximum tolerance, the gage handle, precisely balanced to the weight of the head, drops below the bore axis. It will also drop when the gage encounters such irregularities as taper, belling, out-of-roundness, ovalness or faulty finish. When handled properly, the gage will supply information about bores in aluminum or cast iron as precise as that obtained when the piece is of hardened metal. Handles are insulated so that hand heat cannot expand the gaging head.

Standard Gage Company has a booklet in preparation describing the improved TeBo Gages in detail. Your request will reserve a copy.
INFORM-A-GRAM KEY NO. B78-Q.

New Patents of Tooling Interest

(for obtaining, see page 231)

SCREW-THREADING MACHINE, No. 2,342,8
MILLING MACHINE, No. 2,342,829.
MICROMETER CONTROL, No. 2,342,830.
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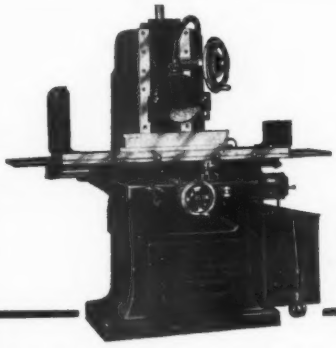

Grand Rapids Surface Grinders are the result of over thirty years actual experience in the building of precision grinding equipment . . . A patented vertical head adjustment is featured. When using the circular Vernier reading for extreme accuracy, the graduated circular plate can be set at zero in relation to the pointer extending inward from the rim of the large hand wheel. The pointer will travel in the same direction as the small inner hand wheel, but at ⅛th the speed . . . Attractive and amply illustrated Bulletin GL-100 is available.

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Timken Graphitic Steel

"Timken Graphitic Steel", the revised and enlarged eighth edition of this well-known booklet contained added data and typographical improvements over earlier editions. The five grades of graphitic steels—Graph-Mo, Graph-Tung, Graph-Al, Graph M.N.S., and Graph-Sil are treated in detail from typical analysis to applications and including all data which a steel buyer would possibly require. The booklet is well planned and illustrated. The enlarged application section is divided into seven parts and shows working drawings and accompanying explanations for reference in planning new tools, dies and other parts. Altogether this section is a representative selection of case histories of tools and parts that have been made from Timken Graphitic Steel. There are also recommendations for 1D, OD, surface and rotary surface grinding of all grades of Graphitic Steel. Copies of the booklet may be obtained from Timken distributors or from the Steel and Tube Division, The Timken Roller Bearing Company, Dept. J., Canton, Ohio. *INFORM-A-GRAM KEY NO. 573-Q.*

★

Co-Ro-Lite Rope Fibre Plastics

Co-Ro-Lite, a ready-to-mold, high-impact industrial plastic compound reinforced by long, tough rope fibres has many application possibilities according to the Allied Products Division T of the Columbian Rope Company, Auburn, N. Y. Recently a practical technique was developed for consolidating and compressing the long, wiry fibres so that they could be charged into a mold and coerced into flowing without chopping or breaking the fibres. The result has been that the advantages of interlocking continuity of the fibres which impart great impact, flexural, compressive and tensile strength have been made fully available for plastic sheets and molded articles.

Co-Ro-Lite is adaptable to high pressure (including flash molds and deep drawing of sheet preforms), low pressure, fluid pressure (or bag molding) and transfer molding. Three distinct types of compounds are available: Co-Ro-Lite "V" Series, a general purpose compound, used where good mechanical

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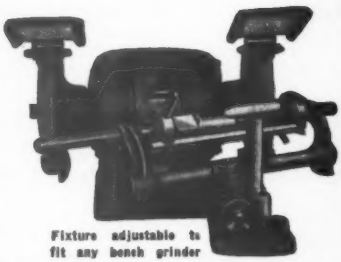
With HOLDING Fixture for Bench Grinder

This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.



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properties are desired; Series "W", a compound characterized by deep penetration of the fibres by the resinous binders, used for moisture resistance, scratch resistance and a harder molded product; Series "P", supplied in fibrous bat and powdered resin form, used for exceptionally high resiliency and toughness. This type is used when sheets are to be drawn into complex shapes. Drawing is done before sintering of the resin or before the sintered resin has set.

An attractive 36-page booklet, well illustrated in color, "Columbian Co-Ro-Lite Rope Fibre Plastics" has tables of properties and characteristics of all types of Co-Ro-Lite. A section explains mechanical tests for the layman and gives simplified formulae. Another section gives design suggestions and machining recommendations. A copy of the booklet is available. Please make request on your letterhead.

INFORM-A-GRAM KEY NO. B76-Q.

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Durite Indurated Plaster

Durite resins incorporated into a normal plaster of paris mix combines the simplicity of plastics molding with the production of stable and dimensionally true replicas from originals of almost any material. In addition resin-plaster casts exhibit low water absorption, freedom from warpage and surprising strength. Such casts are useful for molds, patterns, jigs, core boxes, forming and stamping die parts under rapid setting conditions. Durite S-2682, a cold-setting phenolic material, is well adapted for the induration of plaster of paris. The casts are readily machined, unaffected by the common solvents and resistant to weak acids and alkalies. Casting may be done at room temperature; oven hardening is optional to hasten curing. To gain impact high shock resistance Durite 532, a long fibered, cotton material may be added and the casting indurated with Durite S-1728 by spray or brush treatment. For best impregnation with Durite S-1728 casts should be vacuum pressured. Durite Special Data No. 1044, "Durite Resin-Plaster of Paris Casts" giving full procedure and formulations is available from Durite Plastics Inc., Dept. D, Frankford Station P.O., Philadelphia 24, Pa.

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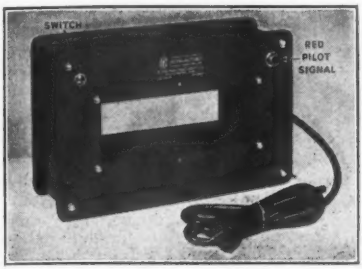
AMC DEMAGNETIZER

A Tool Room Necessity



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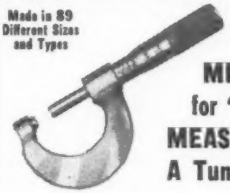

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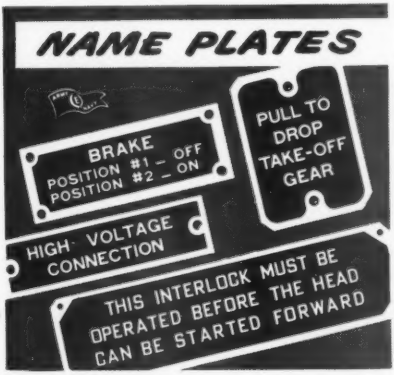
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MILWAUKEE
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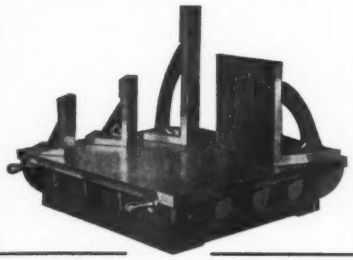

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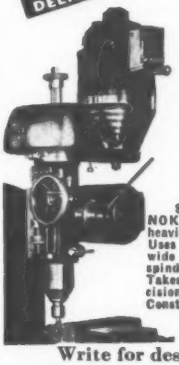

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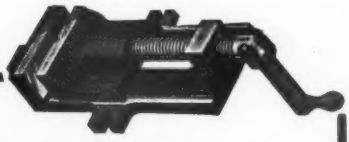

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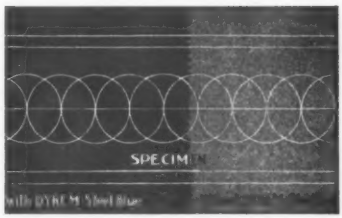

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good conductors of electricity and requires the units to be heated to be placed within a coil subject to a rapidly alternating current; while the former makes use of molecular distortion or friction for heat production. The equipment required is a high frequency electronic oscillatory system fundamentally similar to a radio transmitter.

The two general uses of high frequency electrostatic heating are: (1) to heat non-metallic materials uniformly and at a rapid rate; and (2) to bring about chemical reactions. The principal industrial use has been in the manufacture of resin-bonded wood, including compregnated wood, although such uses as rapid drying of paper, textiles, powders, ceramics and tobacco are practical. In the plastics field two other uses are rapidly growing—the preheating or softening of preforms and the acceleration of airing or polymerization of thermosetting resins.

INFORM-A-GRAM KEY NO. A67-Q.

★

Cerex

Cerex is the designation of a series of new Monsanto thermoplastic compounds with ASTM heat distortion points of 212-256° F. Development has been concentrated on Cerex X214, with ASTM heat distortion point of 220-230° F. Cerex behaves similarly to such thermoplastics as Lustron (Monsanto polystyrene) and Fiberbestos in injection machines. Parts molded to close dimensional tolerances maintain dimensions and mechanical strength during prolonged exposure at temperatures over the boiling point of water. This makes it possible to mold such articles as surgical instruments, sterilized combs, electronic instrument parts and plumbing hardware. Molding qualities are not sacrificed by the increased heat resistance of Cerex; standard injection equipment is used. Mechanical strength compares favorable with that of Lustron; electrical loss properties at high frequency are good. Cerex materials are suitable as replacements of mica-filled phenolics. Two Bulletins—Development Bulletin X200-3 giving technical data and Bulletin X200-1, "Molding of Cerex", are available from the Product Development Dept., Plastics Div., Monsanto Chemical Co., Springfield 2, Mass.

INFORM-A-GRAM KEY NO. 984-Q.

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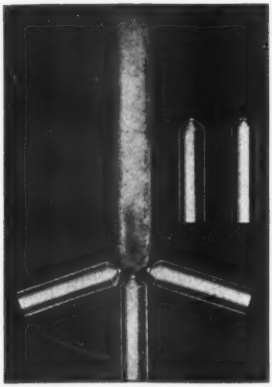

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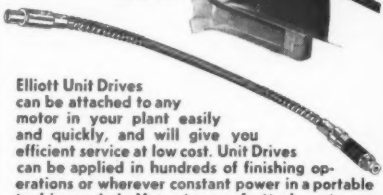

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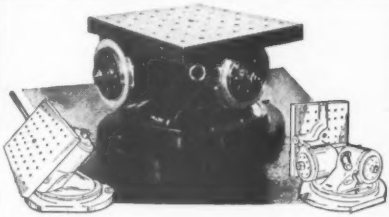

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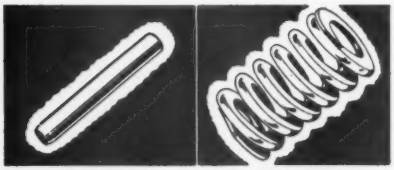

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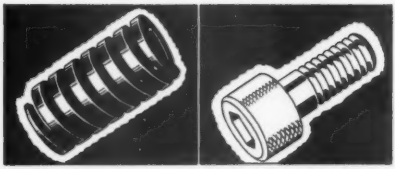
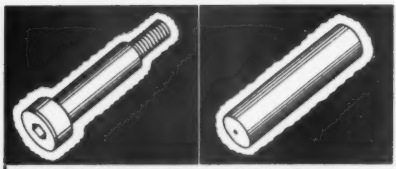


Square Wire Spring | Socket Head Cap Screw



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Leominster Number 5B is the latest addition to the Series 44 line of fully automatic hydraulic injection molding machines manufactured by Leominster Tool Co., Inc., Dept. T, 274 Whitney St., Leominster, Mass. Outstanding features include single screw die plate adjustment, "Centralshaft" centralized die plate support and equalized multiple knockout pin ejection system.

The largest injection machine in the Leominster line, the Number 5B is a 6-ounce machine with a capacity of 55 pounds of molded material per hour. The mobile head is hydraulically controlled. The heavy-duty toggle assembly supports pins full length to eliminate breakage. All indicators and controls, including master clock and relays operation are built in. A positive motion-arresting lock is provided for safety.

Special die plates are available. The company maintains a mold building division. For over 20 years the Leominster Tool Co. has manufactured all types of equipment for the plastics industry and the Series 44 machines are the result of 10 years of manufacturing and research on hydraulic injection molding machines. A circular gives full specifications.

INFORM-A-GRAM KEY NO. B80-Q.

★

THE SUPERVISOR'S JOB is outlined in this 128-page manual by Anthony C. Baudek, Director of Training, McDonnel Aircraft Corporation, and Mark L. Brooks, Director of Training, War Manpower Commission, both of St. Louis, Missouri. The booklet is profusely illustrated by cartoons, and is intended to be used in supervisory training and discussion groups on shop management, although it should be of interest to anyone holding a supervisory position. The supervisor's place in industry, his duties in maintaining a working staff, getting out production, and promoting good employer-employee relations are outlined, and the points which are listed should be useful as a "check-up" on one's own managerial performance, or as a basis for training others. Published by McKnight & McKnight, 109 W. Market St., Bloomington, Ill. Price 80c.

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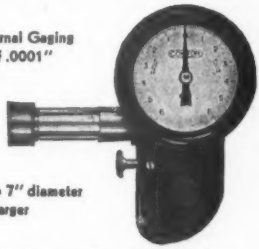

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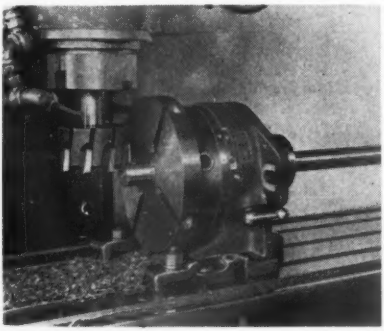

HARTFORD SUPER-SPACER

The adaptability of the Super-Spacer is illustrated here in milling bar stock. It is mounted with a draw-in collet and face plate combination. Many shops use their Super-Spacers to reduce or eliminate tricky setups and special fixtures. Many applications on a variety of operations are shown in Bulletin No. S-101.

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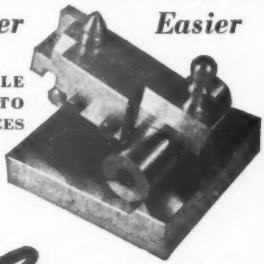

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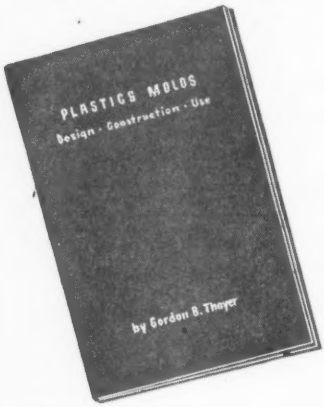

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Tenite II Casting

The procedure for casting Tenite II Melt Cast (Formula 236-S5) is outlined in this practical booklet issued by Tennessee Eastman Corporation, Dept. TD, Kingsport, Tenn. It should be of particular interest to aviation and other shops that require economical, quickly made short run tooling in the forming of sheet metal.

The procedure is outlined for casting a drop hammer punch from the finished die in which it is to be used. Preparation of the mold, of the melt, pouring the melt, finishing the casting, fastening the punch to the press and machining are described.

Advantages of cast plastic forming tools are low cost, time (melt is cast into or around finished shapes or models) and ease of casting complex curvatures. Tenite punches can be cast to finished size directly in the die with which they will be used since the material possesses sufficient resilience to compensate for the thickness of the metal being formed. Tenite II is said to have greater strength than other types of thermoplastics used for casting and is only slightly affected by temperature changes. A higher melt heat is possible without deterioration.

Copies of the booklet "Tenite II Casting" may be obtained on request made to the Corporation at Kingsport, Tenn.
INFORM-A-GRAM KEY NO. A36-Q.

"Will You Use Plastics?"

Issued by Amos Molded Plastics, Edinburgh, Ind., a large injection molder, this booklet presents clearly and simply a number of plastics fundamentals. An outline of an engineering approach to plastics, a brief explanation of the two basic types and the three principal molding methods are given. A number of the advantages of injection molding are listed. The principal characteristics, both of the major cellulose derivatives and synthetic resins are arranged to be of value both to the engineer and the shopman who wants to get his basic facts straightened out. A table of relative properties of thermoplastics molded by Amos, definitions of plastic properties and standard engineering tables combine to make this booklet one of considerable value.
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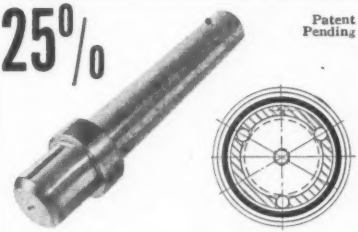
Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

Recent U. S. Patents

METHOD OF CONTOURING SHEET METAL, No. 2,342,026.
INDEXING AND LAYOUT JIG, No. 2,342,033.
POWDER METALLURGY, No. 2,342,037.
FEED CONTROL MECHANISM, No. 2,342,049.
TAILSTOCK CENTER ATTACHMENT FOR BENCH LATHES, 2,342,054.
RIVET SQUEEZER, No. 2,342,089.
ABRASIVE WHEEL AND PROCESS OF MAKING IT, No. 2,342,121.
PRODUCTION OF BEVEL GEARS, No. 2,342,129.
REAMER, No. 2,342,143.
JIG, No. 2,342,179.
MULTIPLE SPINDLE DRILLING APPARATUS, No. 2,342,251.
FUSION JOINING OF METALS, No. 2,342,357.
DRAW RING, No. 2,342,365.
CLAMP FOR METAL STRETCHING PRESSES, No. 2,342,437.
INDEXING OR POSITIONING HEAD, No. 2,342,539.
BENDING MACHINE, No. 2,342,745.
TURNING MACHINE, No. 2,342,792.
PROCESS OF MANUFACTURING SHAPED BODIES FROM IRON POWDERS, No. 2,342,799.

25%

Patent Pending



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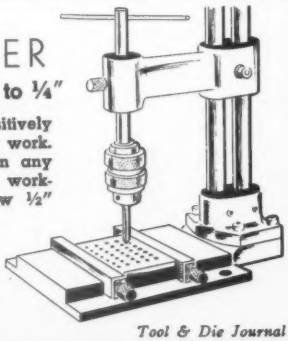

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Gold Plating of Molds

(CONTINUED FROM PAGE 114)

not come in contact with the casting resin were masked off for the gold plating operation.

The time and labor saving acquired by the use of gold plate instead of organic coatings is considerable. For example: Eastman engineers are now casting plastic parts from a gold plated mold in fifteen minutes. The same mold, if protected by an organic coating, would require fifteen hours' time and five hours' labor to prepare. This includes disassembling, stripping, spray-coating, drying and baking, reassembling and molding. Inasmuch as this mold is held to $\pm .001''$ on critical dimensions, an under or over thickness of paint film would alter the usefulness of the mold. From a gold plated mold, identically dimensioned parts can be produced.

The use of the Durez casting resin in place of another material eliminated many machine operations. The resultant saving justified the use of gold plate. However, as previously pointed out, the closer adherence to dimensions, lower costs, and faster production credit the use of gold plating with its own economy.

The three-hour schedule which Eastman engineers established was made possible by several short cuts in the use of Durez casting resin as well as the gold plate. These include heating the mold before pouring, heating the resin before mixing and pouring, immediate heat curing after pouring. It is the use of gold plate, however, that cut the bulk of the fifteen-hour schedule to fifteen minutes.

The cycle of cast resin operation can best be understood by the actual step-by-step procedure:

1. Wipe the mold with a waxed cloth and preheat the mold to 140° F. (Preheating of the mold is desirable. Due to the large amount of metal present, the heat developed by the curing resin would be quickly dissipated if the mold were below the desired temperature. Consequently the curing time would be lengthened. Infra-red lamps can be used to bring the metal molds up to the desired temperature quickly.)
2. Preheat the casting resin to about 90° F.

(TO PAGE 234—PLEASE)

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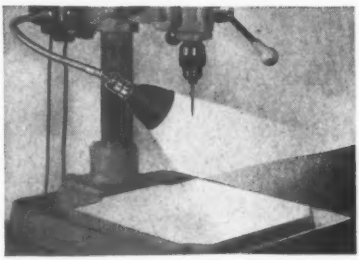

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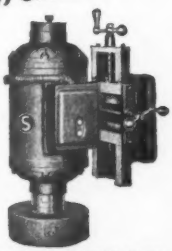

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Gold Plating of Molds

(CONTINUED FROM PAGE 232)

3. Mix the resin with its accelerator and pour into the warm mold.

4. Place the mold in a heating unit at 140° F for 2 hours.

5. Remove the mold from the heating unit and submerge it in room temperature water. (This operation "sets" the casting resin so it parts more easily from the mold. Care should be taken not to chill the resin with water appreciably below room temperature, as the contraction may be too severe and cause cracking. Of course, at this stage the casting is not completely cured.)

6. Remove the casting from the mold in a press which exerts even pressure, by use of proper knockout fixtures.

7. Readjust knockout fixtures and return to operation No. 1. After the casting is removed from the mold, the curing is completed by additional heating time (140° F). Shrinkage by this method is no greater than if the complete curing was done in the mold.

The Eastman engineers summarize the advantages of the gold plated steel mold method of producing accelerated cast resins for precision fixtures in this way: production time cut to less than one-fourth; tooling costs reduced due to elimination of much skilled machine work; metal mold held a run of castings to close tolerances; gold plating allowed use of acid accelerator to shorten curing cycle; and by the use of gold and a wax coating as a parting agent the time-consuming disassembly, cleaning and recoating operations were eliminated.

"Tool Design 90%—"

In addressing the Cleveland Section of the Society of Plastics Engineers on September 29, Carl H. Whitlock, Detroit Manager of Monsanto Chemical Co., stated that tool design and construction were 90 per cent and material molding technique 10 per cent of successful plastic molding. In developing his subject, "Molds and their Relation to the Functioning of Molding Materials", Whitlock maintained that tool design is the most important phase of the industry since tools must be created, while other operations were manufacturing. He reviewed the materials situation and forecast an increased use of preformed impact materials and of styrene.

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(for obtaining, see page 231)

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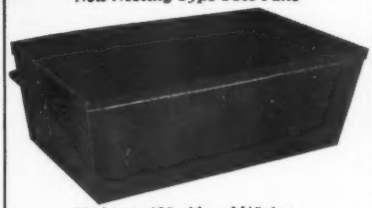

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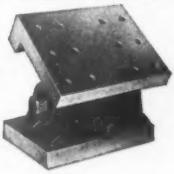

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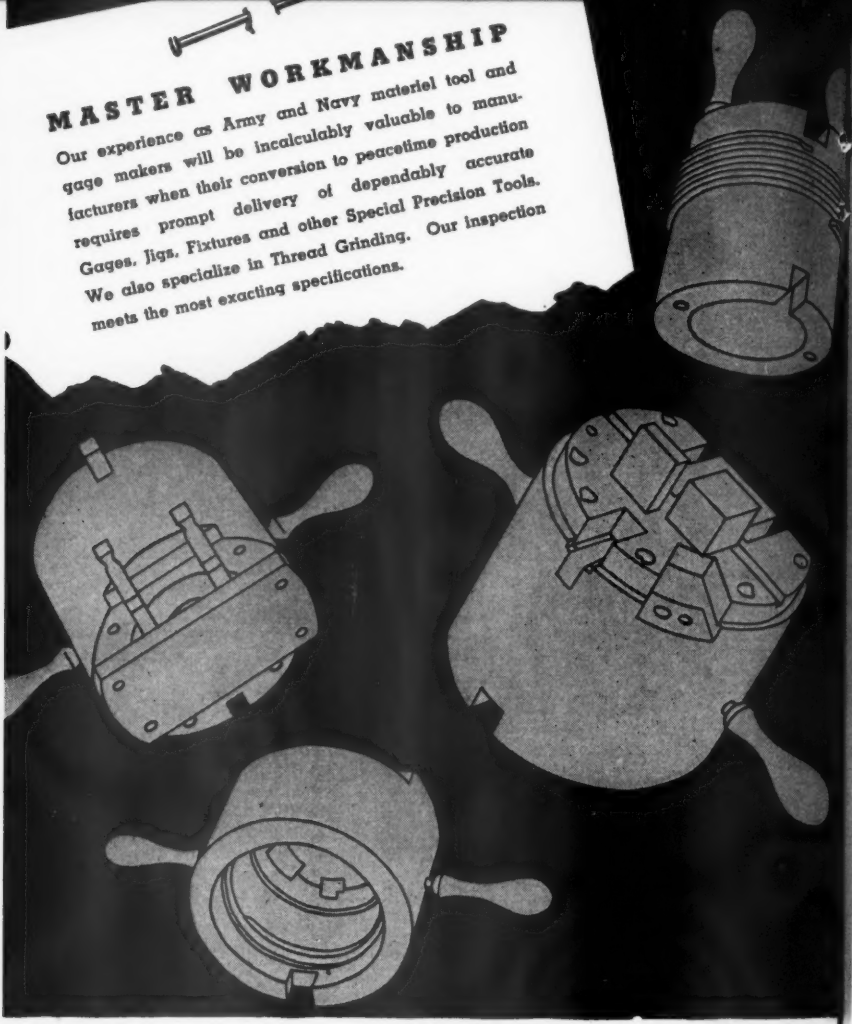

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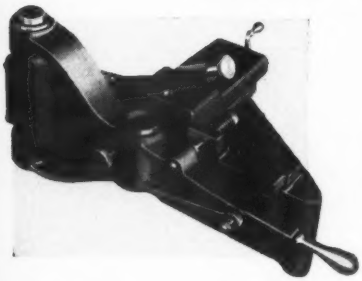

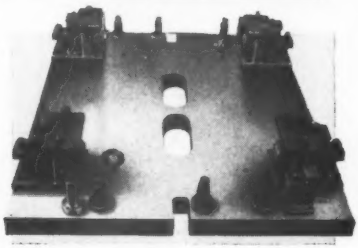

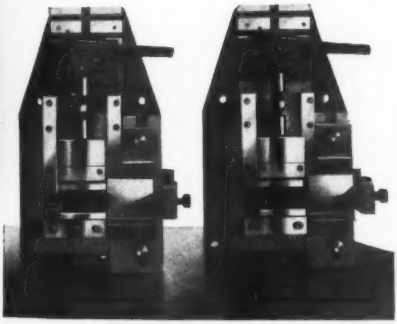

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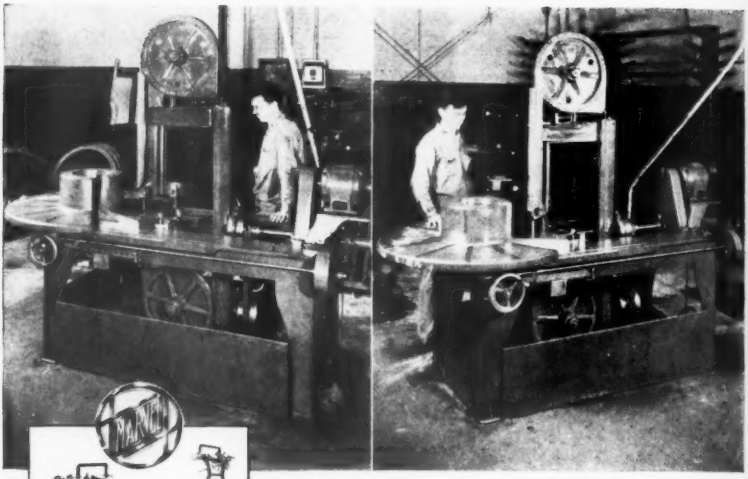

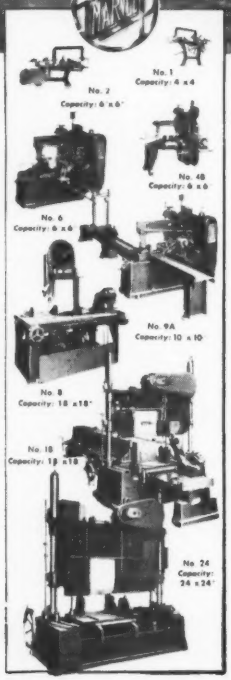

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